The Cause of Wealth

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Table of Contents

Abstract

The cause of wealth creation has been debated for long time. Why some nations are so rich, while people in poor nations is dying for hunger? From education, productivity, to institutional difference, many reasons were discussed, but no compelling theory has emerged yet. This is partially because different types of wealthy countries exist in the world and in the history, and it has been hard to find something in common that could be good candidate as the cause of wealth. I define wealth as exchange, and consider that the difference of wealth is the difference in total amount of exchange in societies. The virtue of exchange is that it increases the utility of labor, which lift the income, and the utility of consumption, which lift the well-being. A better exchange mechanism maximizes the utility of their work and consumption. More exchange means bigger size of economy, and increases the specialization and productivity. From the beginning of civilization till today, exchange played major role to differentiate the rich society from the poor ones. This article analyzes the cost and benefit of exchange, and how it was developed in history.

Introduction

Rationality has been the main source of explaining the human civilization, and logical behavior was thought to be the cause of social development. However, for a human to make correct decision, he has to have the complete knowledge about his environment. From choosing a right profession to evaluating right stock price, people make numerous decisions, but commit a lot of mistakes. This is because it is impossible to acquire all of information needed to make rational decisions, especially in modern complex societies. Also, rational theory is associated with an implication that poor people are irrational.

This article does not rely on the rationality to explain the creation of civilization or wealth, so weather humans are rational or completely irrational does not matter. Instead, diversity and communication are placed at the center of the social

and economic development. Deviant individuals behave different way, and that creates diverse set of behaviors in a society. Although some of these lead to wrong results, others succeed. Through communication, information spreads and entire society can learn from these successes and failures. The more diversely people behave and the more people communicate, the more learning occur within a society.

Accumulation of deviant behaviors creates diversity in economy as whole. Deviant individuals try new things and start producing new products. This is an important step to improve productivity. In rural area of third world country, peasants do little exchange, hence do not have many tools for cultivation. Craftsmen in history did not have sophisticated tools. As a society start to have different products, workers can choose the best tools and equipments for their production, and this improve productivity. Also, diverse industries mean diverse destination of investment, and diverse purchase and sales behavior increase the liquidity of assets. Diversity is the nature of humanity, but also prerequisite for sophisticated economy.

Exchange, diversity, and specialization are strongly related to each other, and all three are in proportional relationship. First, diversity and specialization are similar concept in economics. When an economy is diversified and produce different products, each worker specializes to each product. Diversity inevitably creates specialization. So, these two concepts are different names of same economic phenomenon. Second, the benefit of exchange is proportionately related to the diversity of the items exchanged. When people barter items, they are exchanging utility of them. When similar items, which are assumed to have similar utilities, are exchanged, the utilities mutually gained would be limited. When the exchange items are different, the utility gain would be a lot greater. In modern world, money is used as medium of exchange, but the principle holds the same. The total utility of goods and services increases as the diversity of them. When society has diverse workers who produce diverse goods, the total utility gained would be more. When society has similar industries with homogeneous labor, just like agriculture in third world countries, total utility gained would be less.

Specialization also brings benefits, which are similar to those of diversity, to society. The most commonly understood benefits of specialization include proficiency and comparative advantage. When concentrating to limited tasks, workers get used to them and accumulate specific skills. Also, they usually specialize to the works that they are relatively good at. These increase productivity, hence size of economy. Since specialization is limited by the size of market, just as Adam Smith noted, the bigger economy leads to more division of labor. This creates positive feedback effect of

specialization and size of economy on whole economic system. The civilization was the one that had strong feedback effect of specialization, and rural communities were the ones that did not.

The key for this feedback to take place is exchange. Exchange allows workers to specialize, and maximizes the amount of utility swapped in society, which is actually the size of economy. Just like any other human behavior, exchange is determined by two factors; cost and benefit. The benefit is greater when the goods and services exchanged are different. Giving up a product in order to gain a similar one create only residual utility gain, but swapping totally different goods provide totally new benefit. There are some types of cost. Communication and trust building can be one. Before people exchange, they have to communicate and agree upon what they are swapping. Depending on the types of exchange, some degree of trust might be needed before they commit the transaction. Employment and financial transaction are good examples. Albeit intangible, communication cost is one of the key factor to influence exchange.

Yet, the most important cost of exchange is transport cost, and this shaped the human history. The first reduction of transport cost did not occur by the improvement of transport technology, but by simply living closer. The birth of city was crucial moment for the leap of exchange. When humanity lived in scattered villages, moving goods to the next village was very rare and the exchange was limited to only intra-village. But concentration of population reduced the transport cost to almost negligible level. This caused the large increase of exchange, which increased the productivity, and led to higher specialization and larger economy. This was the first feedback effect human society ever experienced.

The second wave of exchange increase came from the development of maritime transport. From Phoenicians, Greeks to Romans, these ancient traders developed Mediterranean economic zone. They traded, established colonies, and created large size of exchange zone. Here, a concept of Exchange Cost Adjusted Population Density, ECAPD, is introduced. This is the population who live in a area determined as reachable and tradable with a given exchange cost, such as transport cost. This is the size of economy is measured as a population among who exchange can be carried out at the given exchange cost. Mediterranean people used efficient water transport to do commerce in all over the Sea. They spoke the same language, Greek. Roman even united the region politically. All of these led to significant increase of exchange. Even though they lived scattered around at the coast of the See, efficient transport made them closer each other to trade with. This meant higher ECAPD and bigger economy. Middle Age is considered as continuation of the this age of regional

trade. Ship was used for transport at North Sea, Mediterranean Sea, and this time more importantly in the rivers. This contributing factor of efficient water transport to exchange was the same for the Ancient Greece and Middle Age Europe. Regional trade enabled by maritime transport was the second wave of exchange increase.

The rise of modern economy was the third leap of exchange. This was caused by the development of global trade and the rise of financial industry. Global trade was made possible by the development of navigation technology and the discovery of new maritime route, such as going to Asia through The Cape of Good Hope. This lead to the start of global trade in human history. Especially spice trade and colonization created large scale global trade. This increased ECAPD and businesses were operation in much larger markets. Just like before, larger market enabled higher specialization and hence productivity. Yet, unlike before, the global economy necessitated large and sophisticated resource allocation. Enterprises become a lot bigger, which required human and monetary capital at the unprecedented level. These resources had to be allocated to profitable projects. Financial industry did just that. Stock corporations and banks collected large sum of money to finance global enterprises, which was impossible before. Insurance provided risk management option. Through these resource allocation infrastructures, exchange was carried out at much larger quantity. This surge of exchange was the center piece of developing modern economy.

Chapter 1
Human Rationality

<u>1-1 Rationality Model is the main stream thought in economics</u>

Human intelligence has been always the favorite topic of philosophers and writers, and they produced many theories about how smart or irrational humanity is. But that is not the case for economists. They have long assumed that humans are rational, and seldom produced theories assuming otherwise. That is partially because it is just impossible to give an explanation to irrational behaviors and to create a model on it. Also, not many economic theories assume irrationality of human behavior because human being sometimes does behave rationally. In economics, being rational does not necessarily mean being smart, but it simply means that humans react logically and reasonably well to new situation or information. For example, if a price of a product decrease, more people would buy it, or if a company makes more-than-

expected profit, the stock price increase. Also, if humans are irrational, we cannot explain how and why human being has achieved such a sophisticated technology and social system. Rationality theory works very well most of the time.

However, humans do act irrationally from time to time. Stock price overshoots or undershoots, often fiercely. Bubble market kept the price of tulip bulb too high in Netherlands three centuries ago, and investors overvalued the Internet stocks at the turn of the last century. On the other hand, the stock prices under the Great Depression went down irrationally low as well as Black Monday in 1987, the largest decline of stock price. The stock traders are often the most educated in a society, and supposed to be highly rational. So, why these people can make irrational mistakes? Even more importantly, why humans, despite long history of silly mistakes, could develop such a developed societies? The answer lies not in the rationality of humans, but in the social nature of us.

1-2 Complexity of human society and limitation of human intelligence

Before discussing the rationality, the complexity of human society should be addressed. Human being may be rational, but in order to act rationally, humans have to understand this complex world. To evaluate the price of stock, an investor has to have almost infinite amount of knowledge, which includes financial condition of the company, strategy of its competitor, economic situation, interest rate, exchange rate if the company is exporting or importing, and leadership of the executives, just to name some. To estimate the exchange rate, one has to estimate the future interest rate of the two countries accurately, which is affected by future economic growth. To estimate the future economic growth, he has to analyze entire economy.

Let us call all of this information as universal knowledge. Universal knowledge is the complete information set needed to make rational decision. The universal knowledge of calculating a stock price is all information regarding the company, competitors, and economic condition. If someone invented new product and wants to market it, he has to have the universal knowledge about the market and potential consumers. He has to know the perceived benefit of the product and how the existing and potential consumers react to it. It may seems simple, but many businesses cannot estimate the potential benefit of new products, and that is why they sales of new products often sell a lot more, or less, than their expectation. In this case, the universal knowledge of marketing new product is the complete knowledge of consumers' reaction.

Also, let us use the concept of partial knowledge. This simply means partial

information, or the subset of universal knowledge. Since this world is so complex, a person can have only partial knowledge of all information needed. One can argue that no one has universal knowledge, but there are many specialists in all of these sub-areas and they can share or exchange the information. In stock valuation, an investor can read a lot of analysis from foreign exchange specialist, economist specialized in economic forecast, as well as financial analyst in credit rating companies, and he can increase his knowledge almost to the level of universal knowledge. In other words, even if one cannot have universal knowledge by himself, he can use or buy the data and analysis of other specialist. This is actually what many investors do. However, even these specialist are less than perfect and prone to mistake or incompleteness. Very few experts predict future exchange rate, for example. Also, when an investor tries to read an analysis of future economic growth, he has to choose the best analyst. There is extraordinary number of economists from universities to investment banks in the world, and the investor has to have universal knowledge about all of these economists to choose the best. If he cannot chose the analysis predicting the accurate future economic growth, his subsequent decision for stock valuation cannot be accurate, either. So, sill there is the problem of making rational decision to buy or sell a share.

1-3 Three models of human rationality

To formulate the discussion better, some modeling of human rationality would be useful. There are three possibilities about how humans act in a society. One model explains that all humans act rationally in a society. The second model assumes that some human act rationally and others act irrationally. The last one assumes the complete irrationality. These models can be named, perfect rationality model, partial rationality model, and perfect irrationality model respectively.

The perfect rationality model argues that hundred percent of humans have universal knowledge and act purely rationally. This is not convincing from what we observe in everyday life and even rationality-oriented economists would not buy that argument. So, the possibility falls into the two models of partial rationality and perfect irrationality models. To put it other way, the question is not whether or not we are rational, because we are not all rational in pure sense. The important question to ask is how rational we are and how many of humans are rational. This degree of rationality fit with our intuition and experience. Some of us are more rational than others. There is variety of individuals and we all have different levels of intelligence or rationality. To put it precisely, partial rationality model describes human society as

a composition of individuals with different degree of rationality.

Also, there is still the possibility of third model that all humans are irrational, and it is true that there are plenty of silly behaviors both in many societies and history. This sounds very pessimistic and one would wonder how all-irrational humans created such a sophisticated civilizations. However, this article will argue later that even if all people are purely stupid, still humans can develop such a high civilization and technologies.

Chapter 2
Diversity and Communication: Two important characteristics of human society

2-1 First Characteristics: Diversity of economic behavior

This article will elaborate some economic arguments depending on two simple observations about human nature and society. One is diversity[1] of human behavior and the other is communication. Diversity is very important human nature and it takes various forms. Specifically in economic behavior, diversity takes three forms; investment diversity, consumption diversity, and labor diversity.

Investment pattern is different according to each individual. Some take more risks, and they are likely to invest in risky market such as stock market, while others stay with saving account. The difference is not limited to financial investment. Education is one form of investment. Students invest their time and money to go to universities expecting that they can receive investment return as a form of higher income in future job. Government often subsidizes education cost expecting the return in a form of higher tax revenue that educated worker produce. Even here, people take, consciously or not consciously, different decisions to educate themselves. Some stop studying at high school, others go up to PhD. At university, students choose their major from variety of academic fields, and they choose one mainly depending on their preference and perceived future benefit from it. Companies invest in new projects or product developments, or can purchase another company to increase the size. In other words, people, government, and companies invest in diverse forms of investment, which creates diverse kinds of return.

[1] Diversity in this article dose not really mean ethnic diversity, but it is more about the diversity of profession, economic decision and behavior. Ethnicity often influences the economic behaviors. However, the diversity of economic behavior is the primary focus and ethnic diversity is one of many factors that influence the behavioral diversity.

Consumption diversity is second category of economic diversity. People consume diverse goods and services to satisfy their different needs. Consumers buy different things according to their preferences. Some people might buy shoes from Chanel, but others buy from Wal-Mart. Some are health conscious but MacDonald's is still making money. There are different types of PCs, and each of them has slightly different specs. Usually, consumers chose the best combination of CPU, RAM, and hard drive, but other power users are interested in video card and motherboard also. Consumers have different needs and preferences, and that creates diverse consumption behavior.

Labor diversity is the third. After people finish investing their time and money into education, they start working according to their education level, specialty, and preferences. At the end of education, young graduates already have different levels and types of skills and specialty. After they start working, the variety of their skill becomes wider. An accountant in a company might have to learn some specific and unique accounting rules only used in that company. A sales rep has to learn about the products and promotion plans of his company. So, accountants and sales reps in a company have slightly different knowledge and skills compared with the ones in other companies. Lawyers and doctors start specializing themselves after they start working. Just like other diversities, labor skills are slightly different from each other, and this small difference accumulates into a wide spectrum of diversity in a society as a whole.

2-2 The causes of the economic diversity

Similar to other behavioral difference, the diversity of economic behavior is caused by individual and social difference. Each individual has different degree of rationality as discussed before. But there is a lot more in individual diversity. Each individual has different area of knowledge. Some people know a lot about car, and others are familiar with house. The one who have knowledge about these products is advantaged to buy the best for their needs. Also, people have different preference in consuming goods and services from breakfast cereal to vacation destination. In investment, attitude to risk creates difference. Some are risk-taker, while others are risk-avoider, and that leads to different investment pattern. All of these differences make people act different way.

Social difference also contributes the diversity. Other than common examples that influence behavior such as family or ethnicity, some factors should be added to consideration. Geographic location and environment also contributes to human

diversity. Climate influences food production and consumption. People near the coast deals with fish, where as people in open field produced and consumed agricultural products. If a person is living in a remote village, his opportunity to engage in commerce will be limited. Not doing commerce does not mean being irrational, but the high transport cost simply dose not allow him to do trading. It is important to note that difference of geographic location often create behavior diversity as much as the individual difference.

<u>2-3 Examples of diversity observed in developing countries</u>

Diversity of people in developed countries is relatively well noted, but it is not recognized so much regarding developing countries. It could be true that many of them have generally less diversity than rich countries do. Developing nations tend to have mono culture economy and to have limited choice for consumption. Many of them are subsistence farmers, and the poverty prevents them from exploring many choices and possibilities. However, diversity does exist in developing societies and the principle and cause of it is the same with rich countries. So, it is even helpful to illustrate the diversity of developing nations.

There is a refugee settlement in Zambia near Congo boarder, located in northwestern province, about 12 hours of drive from the capital, Lusaka. It is called Meheba Refugee Settlement[2]. It was established in early 70's to accommodate the increasing number of refugees from Angola, where civil war was intensifying. During the history of three decades, it received some more refugees from other countries, notably Congo and Rwanda, so it expanded the size from time to time. It is not refugee camp, where refugees just wait the war to cool down and aid agencies keep providing food and other necessarily service. However, Meheba is a settlement. The refugees are given a certain area of land to build their house and cultivate their food. The support from aid agencies is kept minimal and the refugees are expected to live on their own.

It is one of the biggest settlements in Africa with approximately 40,000 refugees in area of 872 square kilometer (roughly 336.7 square mile). This makes unique social and economical environment. Almost all of refugees are farmers, so it looks like just another African village, but it is just a huge village. Also the relatively high concentration of population created several commercial markets, where refugees can buy basic goods, such as soap or farming tools, from other refugee merchants. There are five simple clinics and six schools, one police station, and even a vehicle

[2] The author was a volunteer in the settlement, acting as project manager for a NGO. Some of the observations and findings used in this section come from the survey we conducted.

workshop, although all of them are owned and operated by either Zambian government or aid agencies, such as UNHCR.

The economy is very mono culture. One survey indicates that 92 percent of refugees cultivate maize, a staple crop for most of them. 38 percent cultivate cassava, which is secondary staple food (The total exceeds 100 because some of them cultivate both). This is nothing new. Most of developing countries depend on their economy on one or two crops. However, a close look to their agriculture shows large diversity even in that African village. 22 percent of refugees cultivate beans, the cheapest source of protein, half of them keep chicken, and about a fifth feed goat. Income difference is formed also. The top one third of farmers produce about 81 percent of all maize production combined in the settlement. In other words, a few riches farmers produce large chunk of maize in Meheba. These rich farmers have larger field, so they hire other refugees to cultivate for them. The rich employ the poor, and takes large share of production. This is just like any other rich societies.

All of these illustrate how different these refugees are. When refugees came to the Meheba settlement, most of them had nothing. Some started to work hard or found fertile land, while others worked only to sustain their lives. Other than cultivating maize and cassava, many refugees produce secondary food of their choice to supplement their diet. Considering that Meheba settlement has only thirty years of history and it is a largely mono culture economy, this is rather considerable diversity.

2-4 An example of diversity observed in economic principle

Diversity of behavior is something that economic theory is depending on, often implicitly. Without assuming diversity, some of the economic principles become less valid. The law of supply and demand is probably the most fundamental and important principle in economics. The law of demand says that as the price of a product decrease, the quantity of demand increases. This is because the perceived utility, or benefit, of a product is different according to each buyer. Some feels more utility and they chose to buy it at even high price, and others feel less utility, so they do not buy unless price decreases. People buy the product only when the cost becomes less than the expected benefit. When demand of a good increases, which means there is more people who want it, there would be more probability that some of them put higher value on that product. Each individual makes slightly different decision, but, again, as a society as a whole it creates wide spectrum of behavior. Since the law of demand applies to most economic activities, the diversity is the key aspect of economic phenomenon.

Supplemental note – Most behavioral diversity is expressed in standard distribution

Most of human diversity is expressed in standard deviation. Just like the distributions of height or income, most people behave slightly different way from each other and a few behave largely different way. Making bar chart, vertical axis being number of people and horizontal axis being degree of difference, the chart will look like a bell. The income distribution tends to be like that especially in rich countries[3]. The difference of IQ, hence rationality of people also, makes a bell

In the world of marketing, there is a concept called product life cycle, which follows a mathematically modeled logistics curve. This model means when a new product is introduced to the market, and sales increase only a little by little. Not many people buy it at the initial stage partially because the price is high and because only a few consumers are “early adapter”. Early adapter is the people who buy new product when it is introduced to the market. This includes, for example, consumers who bought computers with MS-DOS when PC industry hardly existed. As the companies produce more, the price decreases and more people would get to know that product. In that stage, the sales start to increase a lot. This is the growth stage. At the last stage, it becomes difficult to convince a few “late adapter”, and the sales become slower. Late adapter means a consumer who does not chose to buy certain products even when the products become norm in a society. There are people who still do not use computers, for example. This model implies that there are only a few “early adapter” who buy a product even when the product is not well known to the society. Majority of consumers behave similar way in a sense that they wait until the many others start buying a product or that certain level of low price make many people to buy it. At the other end of spectrum, there are a few people who are very hard to get convinced to buy that product.

<u>2-5 Second Characteristics: Communication and learning</u>

Communication plays very important role in every aspect of human society, and economy is not an exception. This is the second characteristic of human society, which this article depends on. The importance of communication, or learning of new

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[3] The income distribution of a third world society often does not form bell shape of standard distribution. Usually it has only a few rich and too many impoverished people. That is probably because the researchers always use cash income for measuring the income. This is not accurate way since only a few of them have cash income. Agricultural production, for instance, would be a better way. The standard distribution of maize production was well observed in the Meheba community.

information, has been noted by many scholars. Human beings are social animals. We keep communicating and we keep learning new things from each other. That has been one of the biggest engines for the social and economic development.

The communication becomes even more important when the diversity is put into consideration. We learn from each other because we are different. If we are identical and behave identically, we always make identical successes and failures. In that case, we can not learn from each other. We communicate and learn from each other because we make different decisions and, hence, different results. Take an example of crop selection in the above mentioned refugee settlement. Angolans' staple food is maize and they do not traditionally cultivate sweet potato. However, it is one of a few commercial crops in Zambia, where Angolan refugees escaped to, and it is relatively easy to sell. So, just like early adapters in product life cycle theory, some Angolan refugees took the risk and started to cultivate sweet potatoes. The result was good and the early adapters earned some cash. Soon, many others learned. Shortly, the ratio of refugees who cultivate sweet potato went up to almost 50 percent, making it the second most popular crop in Meheba only after maize. At one harvest season, large size trailers were arriving to Meheba almost every week to transport sweet potatoes. This is typical example how small number of deviant people starts new thing and how others learn from it.

People learn from other people's mistake, too. Refugees in Meheba are given certain area of land to cultivate, but they have to cultivate the same land for every year, in some case two or three decades. Ordinary Zambian farmers can do field rotation. They cultivate one field for one season or two, and change to another one in order to let the field rest for some time and wait till nutrients come back. Refugees could not do this because the plot given to them was not large enough for field rotation. So came the need of fertilizer. One Zambian fertilizer company came to Meheba and started to market fertilizer to them. Since not many refugees had enough cash to buy it, the company came up with a credit scheme; the company gives the fertilizer to the refugees on credit basis, but they have to return it in the form of maize when they harvest. This fertilizer-to-maize credit scheme got instant attention, and some refugees, just like those who started sweet potato cultivation first, took the risk and signed contract with them.

The result was bad, just to put moderate. The harvest was not so good for unknown reason, and many refugees could not return the debt. Nobody knows why the harvest was not so good. Some refugees say the company cheated and the fertilizer was not real. Other possibility is that the refugees could not have used it properly.

The fertilizer has to be used properly as specified in the instruction and put at the right quantity at the right time of cultivation. However, many refugees were illiterate, so could not read the instructions. As happened in other parts of world, when an uneducated people use credit scheme, they often could not manage it, or even got cheated. Meheba refugees were not exception, and many people who could not return the debt were sent to court. The other refugees learned very quick, and virtually none of them used the scheme next year.

This is another example to illustrate how the diversity and communication are so important. It seems bad that some refugee took the scheme of fertilizer-to-maize credit, but it was actually good that only some signed the credit contract, and many others did not. If Meheba community were not diverse and many people think alike, a lot more of them could have signed together, in which case the result could have been even more devastating.

Learning and communication modify the behavior of educated people in rich countries also. Take example of IT boom. First there was the rise of technology companies. Apple Computers, Microsoft, Intel, and many others grew exponentially and investors made literally huge amount of money. Many investors learned, just like refugee farmers learned that cultivating sweet potato made profit, that IT companies were attractive investment destination. Then, came the dot com companies that were trying hard for IPO. Many investors put money in them. Also, executives and professionals in big technology companies quit their jobs and started working in start-ups. They invested their professional career. The house price of Silicon Valley went up as the number of ventures increased. The fact that many of these ventures were not making money did not bother them. After sometime, it became clear that very few of these ventures would be like Intel or Microsoft. The Internet bubble busted, and many of loss making ventures went bankrupt. Just like refugees who lost their maize for fertilizer, the investors and professionals wasted a lot of time and money.

Learning the marketability of sweet potato and danger of credit scheme is very simple. Many dot com investors did not learn until they loose money. However, the communication spreads the right decisions and best practices of economic behavior, and the accumulation of small enhancements and correcting mistakes improves the economy.

2-6 Exchange as a form of communication

The communication can take many forms. Talking and listening are probably the most basic and traditional form of communication. Then humans discovered

reading and writing, which expanded a lot after the invention of paper. Now communication can be electric. In a broad sense, an action is a form of communication. If a girl stops writing emails to her boy friend, it usually means something. Psychologists say that most of communications take form of non-verbal communication, instead of verbal. For instance, eye contact and tone of voice are important part of communication.

A commercial activity, or exchanging, can be a form of communication, too. Surely, it is not sophisticated communication, but it is a simple form of sending information. As an example, let us assume that person A exchanges two of his banana with an apple of person B. From that transaction, person A will know two things about person B. One is that person B is in the need of banana. Secondly, person B sees the value of one apple, or more, in two bananas. If person B dose not have the need and does not feel that value, he simply refuses to exchange. For a real example, increasing sales of salad in McDonald's means the change of consumers' attitude to health. In other words, when we observe an exchange or any kind of commercial activities, we are retrieving and learning some new information from it.

A stock market is another example. It is a collection of investor's decisions, and the market index is mathematical calculation of investors' will. It increases or decreases as the investors behave more optimistic or pessimistic about the future. Many news program report the stock market index every day because it shows what investors are thinking and what decisions they are making.

Exchanging is communicating. This is one of the reasons why information flow increases as commercial activities develop. In a village of subsistent agriculture, where people do not exchange things, there is no need to know each other. Their main economic activity is cultivation, so they tend to work alone or in small number. They often know each other well, but that is because they are living in same village for long time. Yet, if people engage exchanging, they will know each other from different point of view. Selling is a surest sign of excess of that item, and buying is the surest sign of the needs. They know each other because exchanging itself is a form of communication and because they have to know each other in order for better exchanging. When humans started long distance trade, such as Phoenicians in Mediterranean Sea, they started to transport information as well as merchandises. When they transported a wine from Greece to Tunisia, Tunisians received information about Greek wine, such as its price and quality. In modern capitalism, stock market index shows the average decisions and thoughts of investors, and a decline of McDonald's sales indicates unhappy consumers who want healthier foods. In a society where merchants exchange

goods and service, information is gathered more and moves quicker.

<u>2-7 Economical development under diversity-communication model</u>

Behavior of human being is diverse by nature and the communication helps its economy to optimize. These two characteristics combined can form Diversity-communication model, which explains economic development with different perspective from conventional economic theory. As behavior becomes diverse and communication increases, its economy grows. The below is the principles how diversity and communication explain the development of economy.

2-7-1 Diversity increases the benefit of exchanging

First of all, diversity increases the benefit of exchanging. Suppose that there are two persons, and one cultivate wheat and the other barley. If they engage exchanging wheat and barley, the benefit would be limited because these two crops have similar nutrients. Yet, if one of them cultivates vegetables and exchange with wheat, both parties can consume carbohydrates and vitamins. If there are a hoe manufacture and a farmer, they can exchange hoe and crops. The hoe would increase the farmer's yield, while the manufacturer can fill his stomach. In Meheba settlement, there are goat traders. They tie a goat on the back of bicycle, and cycle to Congo boarder. The trip usually takes two or three days one-way. On the boarder, they sell it for cash, or exchange it directly with a bicycle because it is cheaper in Congo. In this example, the refugees exchange goat and bicycle, and this is rather beneficial exchange since these two items require very different comparative advantages to produce. In some case, a single farmer might cultivate wheat and vegetables and can feed himself with different foods, but just one person simply cannot cultivate foods and manufacture bicycle at the same time. Exchanging different items brings a benefit that is impossible to realize without it. In principle, the benefit of exchanging is proportionally related to the difference of the items. Exchanging wheat and barley is less beneficial than exchanging more different products such as wheat and fish. Exchanging goat and bicycle is a lot better. If a society has diverse industries and products, it can benefit from exchanging them. The more diversity the society has, the more benefit it can realize.

2-7-2 Diversity creates diverse decisions and its outcomes

Also, diversity creates different types of success and failure, creating higher number of good and bad lessons to learn from. Human rationality is a help but not

compulsory for success. It is just matter of probability that the number of successful decisions, as well as unsuccessful ones, increase with more diversity of behaviors. In the above-mentioned case of fertilizer credit scheme in Meheba, it was good that only a portion of refugees mistook to sign the fertilizer to maize credit scheme. If the refugees were the same and all signed the scheme, the result could have been devastating. If none of them have signed, they could never mistake and learn from it. The refugees also cultivate various crops and vegetables, and that is why they can choose the best crops for the soil and climate of the settlement. The more diverse crop they try, the more number of good crops they would find.

The same is true in developed countries, too. There are diverse investors in stock market, and they invest in stocks of various companies and industries. They invest differently because they have different thought and analysis on various investment opportunities. Not all of these investors are rational, and every one of them has unique rationality or irrationality. That is why they make various success and mistakes. Some invested a lot in new IT companies and made huge profit, and some invested in other industries. Some student invests their time to be a programmer, and others become a mobile phone sales rep. Just like crops selection in Meheba, there are different successes failures in investment or career selection. As people try new thing, the rest of people can learn from it.

Diversity makes different degrees of correct decisions. Some decisions are very accurate and rewarded with huge benefits, while others are moderately correct and rewarded only moderately. Many people copy very accurate behaviors, while fewer people copy the moderately correct ones. In other words, diversity makes large degree and quantity of success and failure, and the more correct decisions prevail more. As a consequence for an economy as whole, it always optimizes. The more diverse people behave, the faster the economy optimizes.

2-7-3 Diversity creates diverse inputs and means of production

The third benefit of diversity is that it can provide diverse inputs, tools, and equipments for production, hence improve productivity. If a farming village cultivates various crops, vegetables, and cattle, they can consume different foods. That will improve their diet and make them healthier. They will have less sickness, and can work longer due to more calories consumed. If that village has a craftsman who makes hoe and plow, the productivity improves even more. As the types of tools available increases, a farmer can chose the most suitable one for particular work, so he would be more efficient. In rich countries, the evidence is even clearer. These sophisticated

societies produce extremely diverse products. Workers use heavy machineries and manufacturing equipments, and these are the big source of productivity improvement. A lot of parts and supplies are needed to produce these equipments. They needs rubber to make tire, oil to make lubricants, or steel to make the body. The society needs extremely diversified specialists to sustain sophisticated industries.

2-7-4 Diversity creates diverse types of investment opportunities

Diversity ensures better utility of capital through different types of investment opportunities. In mono culture countries like Costa Rica, for instance, where majority of people engage in banana or coffee industries, most of the investment opportunities are related to these agricultural commodities. Costa Rica does not have many factories, so little machinery and equipment investments are needed. There are not many corporations and stock market is not well developed, so stock investment opportunity is limited. On the other hand, in rich countries there are full of different investment opportunities in diverse industries. Derivatives, stocks, bonds, CD, or R&D in various industries, are just a few examples of investment destinations. These investment opportunities inevitably have different characteristics. Some are long-term investment and others are short-term, while some are riskier than others. Also, liquidity varies a lot from investing in stock to constructing a new plant. The capitals have characteristics and requirements, too. Some capitals can take risks or wait longer to receive returns, but some capitals need to seize quick cash. Some capitals can take only small risk. When economy becomes more diverse, it can provide wide spectrum of investment opportunities, which lead to better utilization of capital. Therefore, diversity improves resource allocation and helps to increase total return as a society whole.

2-7-5 Diversity increase the liquidity of assets

The fifth and lastly, diversity increases the liquidity of assets. In Meheba Refugee Settlement, goats are the most common cattle. It is one of a few assets as well as protein source that the local community can have. Usually in rural area of developing countries, liquidity of any assets is not so good because there are not many buyers. However, there is more liquidity in Meheba than in other villages due to its diversity. First, there are some higher-class refugees who are cultivating more land and producing more. They have more money, so they could afford to buy expensive cattle. Also, there are goat traders, who trade goat at Congo boarder. They are always happy to buy goats as long as the price is reasonable. These people are not plenty, so

refugees can not sell a goat anytime they want, but definitely they have more liquidity compared with other Zambian village. In other words, because there are different refugees, rich people or merchants, the assets are traded with more liquidity. If all refugees are the same, it is extremely difficult to sell a goat.

Diversity is also important for the liquidity of financial markets in rich countries. In a financial market, there are many different investors and they sell and buy with different thoughts and analysis. There are technical analysts who look at a chart to see future activity, or investors who check the financial statements for fundamental analysis. There are speculators who care about the price of five minutes from now. When investors have different ways of analysis and thoughts, they would have different valuation of the stock. The pessimistic investor would sell GM stocks, and the optimistic one buys them. If all investors have same thoughts and analysis, no transaction would occur. Suppose that share price of GM is 36 dollars, that means that the last transaction in the market was done by a investor who thought 36 dollar was cheap and the one who thought opposite.

Rationality theory of economics says that when a company makes less-than-expected profit, the stock price plunges. Suppose a simplified case that stock price of Ford Motor is 100 dollar, and is expected to make 10 dollar of profit per share, making 10 percent of return on equity. If the company announce 8 dollar of profit per share, the stock price would go down to 80 dollar to keep the return on equity of 10 percent. Curiously, the price does not jump from 100 dollars to 80 but decreases gradually. The price goes down to 99 dollar first, then 95.5, 89, 87.8, and so on. After some time, it reaches the optimal price of 80. There are two things that are not compatible with rationality theory. One is that there are investors who paid 95.5, 89, and 87.8 dollars, or simply put, they paid more than optimal price. The price might reach to the optimal price, but in the process to achieve it, there are some "irrational investors" who pays more than rational price. If the investors were all rational, the stock price would jump from 100 dollar to optimal price, because nobody would buy between the two prices. Secondly, not all investors react to new information. Among thousands of Ford stock owners, there are many who do not try to sell it. There are long-term investors or individual investors、 who do not stick to day-to-day trading. If all investors jump on selling stocks after the profit announcement, the market would be a lot more volatile than what it is now. The liquidity of assets, one of the most crucial components of modern financial markets, depends on the diversity, not rationality, of investors' mind.

Supplemental note –Diversity-communication model provides better explanation of

human society than rationality

As discussed in previous chapter, perfectly logical model of human society does not fit with the actuality that we observe in everyday life, and only partially logical model or perfect illogical model were considered left possibilities. Diversity and communication provide the framework to explain the social improvement without human rationality. As long as humans behave different way, some will succeed and other will not. The rest of people just have to watch them, and try to imitate the success or not to repeat same mistake. The first people who try different behavior dose not have to be smart or logical. Even if they act differently by chance, there would be different results. If people see the different results from different behaviors, they can follow it just as blindly as Pavlov's dog.

The only difference that a human intelligence can make is the speed of optimizing economy. If some humans act logical, the new behavior they do would be more accurate than the new behaviors caused by chance. That would make the discovery of better behavior more quickly. Also, after observing somebody's success or failure, logical people would learn quicker. However, as long as people keep behaving differently, the humanity eventually will find the best and accurate behavior even without rationality. In other words, diversity and communication is mandatory for economic development, but rationality is not.

Chapter 3
Exchange

<u>3-1 Wealth means exchange</u>

Exchange is the most important magic in human society to increase economic well-being. Person A has something that person B wants, and person B has something that person A wants. Just by exchanging these items, both parties can increase the utility of what they have. They become better off without working longer hours, spending other resources, or increasing production. This magic of exchange is they key to understand wealth.

Wealth consists of two components; production and consumption. A person is wealthy when he produces and consumes more, both of which are result of exchange. People exchange their labor for salary, and exchange that money for goods and services. The better exchange people do, the more income and better consumption they can have. Sophisticated exchange increases the utility of labor, which means higher

salary, and the utility of money, which means better consumption. In short, wealth means exchange.

3-1-1 Wealth does not mean simple possession of money

This article defines wealth as exchange. Yet, the first thing people actually associate with wealth is money. Money is probably the best way to measure the wealth, but it is not the wealth itself. Money is just a liquid medium for exchange. In a barter economy, both parties have to have items in need of the other. In currency economy, only one party has to have the needed item of the other, and he is simply paid for giving what he has. Also, in barter system the time of the exchange is the time of selecting consumable items. When a person barters an apple for an orange, that is the time he made decision to consume orange. Yet, in currency economy, a farmer sells his apple for cash, and that is the act of delaying his decision to choose an item to consume. So, owing money means owing the ability to consume in the future, and having a lot of balance in saving account means total amount of delayed consumption. In stead of simple possession of money, what make a person wealthy is the ability to earn more income and the freedom to spend it in various goods and services. To be more specific, wealth is composed of higher income caused by better utility of labor and higher consumption caused by better utility of income, and both are result of exchange.

3-1-2 High income means better utility of labor enabled by exchange

From the peasants in Indian village to stock traders in Wall Street, the income of human being varies a lot. The poorest of the world would be the subsistent farmers in third world countries. They are poor because they only produce, and do not, or can not, exchange the crops. They can not use sophisticated tool or machinery due to lack of exchange mechanism in their society. They do not have division of labor, which hinder them from exchanging various specialties. In other words, when they produce, there is little exchange involved. Therefore, the total value they can generate is limited.

On the other hand, there is plenty of exchange in the labor of developed countries. Few people work to produce food or cloths for themselves, yet they exchange their labor to earn cash income. Division of labor enables to exchange various skills and expertise within organization in order to improve productivity. Investing into education, using computer, or division of labor are all different types of exchange, and these exchange create higher productivity, and hence higher income. Impact of exchange on productivity is broad issue, and more detail of it would be described later

this chapter and next chapter.

3-1-3 High consumption means better utility of income enabled by exchange

Consumption is crucial half of wealth, but higher consumption dose not means more consumption of same item. Instead, it means the consumption of diverse items. This depends on a simple analysis of human needs. Some say humans are greedy and human greed is infinite; people always want more and more, and it never stop. However, basic economic law of diminishing utility of good describes human desire differently. It says when a person gets one item, he will have less need of having another. If a person is hungry, he is in need of bread very much. But once he has bread, he would have less need of another bread and more need of other goods. The interesting observation about human greed is not that it is infinite, but that it is diverse. Once a person has enough bread, he starts wanting cloth, car, or house. Vacationing in the beach is not enough, so people go to skiing, mountaineering, or even Disneyland. Also, any society has diverse kinds of people, and each individual has different preference and needs. Therefore, a society can make its people better off when it can satisfy diverse needs of people.

This diverse need necessitates diverse production. A society has to produce various goods and service to satisfy the maximum needs of maximum people. If all humans have homogeneous need, say the need for wheat, the increasing of wheat production makes all people happy. However, since human needs are very diverse, a society has to produce equally diverse products and services. No single individual can produce such diverse products, so he specializes in a particular productions and exchange with other people's output. This is the crucial point of understanding the mechanism of wealth. A wealthy society is the one that can produce good composition of diverse goods and services to satisfy the needs of its people. This can be possible by exchange and specialization. The more sophisticated an economy becomes the more exchange it would commit.

To put it other way, wealth is not about how much money a person, or a nation, has, but it is about what and how much diverse goods and services it can buy. Wealth is about utility of money, which increases with diversity of items it can buy. In a simple village without trade with outside, a million dollar, or a ton of gold, dose not have so much value, because it can not buy many things. Rich countries are considered wealthy not because of the quantity of the money they have, but because their economy can provide diverse items for exchange. Now it is the norm to measure national wealth by GDP. Yet, GDP, especially adjusted by purchasing power, is

actually better to be termed as GDE, Gloss Domestic Exchange. It is the total amount of exchange took place in an economy. Wealth is equal to exchange.

<u>3-2 Types of exchange</u>

3-2-1 Intra-family exchange

There are several types of exchange. The first exchange that human being ever committed in the history was intra-family exchange. This is the oldest and most universal form of exchange. Father does farming and mother does housework. Grandmother might take care of grandchildren. Father receives housework service for his production of crop, whereas grandma receives food for her nursing work. It sounds old-fashioned stereotype, but humans actually could concentrate on what they were relatively good at and exchange it with other family members' services. Just like any other form of exchange, it enabled the specialization in a particular labor and the diverse consumption of foods and services. Without intra family exchange, grandma might have to cultivate field at the age of 60, and father might have to do all the housework and cultivation. In modern day, family can buy dish washer, eat prepared foods, or receive nursing services for their kids. So, this intra-family exchange is diminishing. However, it is still the basic exchange that people do in daily life.

3-2-2 Barter

Barter is probably the least common and short-lived form of exchange. In a remote village or less developed society where money dose not exist, barter is the only option. When there are only a limited number of items for exchange, barter might work. But once the society starts producing variety of goods, soon it would start using some form of exchange medium, such as money, gold, fur skin, or even seashell in some culture. In any case, barter is used only at the beginning in the development of exchange, and not very common in modern days.

3-2-3 Commerce

Commercial activity, selling and buying, of goods and services is the most commonly recognized form of exchange. Using a medium of exchange such as precious metal or money, the merchants acquired huge flexibility for finding the sellers and buyers. The record of commercial activity goes back to the beginning of civilization or even more, and this is one of the most fundamental parts of human society. Commercial activity as a form of exchange should also include financial activity. All

investments are the exchange of putting money at risks and taking the future return. People invest their money in stocks for dividend in exchange of deferring the consumption and taking the risk. The invested company receives the money in exchange for the obligation to pay back in the future. Stocks and bonds are sold and bought, interests are swapped, or future contracts are singed. All of these are types of exchange. There are various forms of investment, and hence, various forms of risk, return, and the obligation to pay back. Yet, in all investment, people are exchanging money, risks, and future returns in some way or another.

3-2-4 Employment exchange

The employment is probably the least recognized form of exchange, but it is by far the most important part of modern economy. In all developing societies, employment practice is not so sophisticated or does not exist at all, but in rich societies, it is a lot more advanced and crucial part of economy. Employment exchange is one of the crucial differences between the poor and rich societies.

There are two aspects of employment exchange. One is that it is simply the act of buying and selling of labor. Employer gives money in exchange of labor provided by workers. In case of Meheba Settlement, poor refugees were employed by rich refugees to cultivate for their fields in exchange of food, usually dried fish. Even though money was not involved in this transaction, it is good proof that employment exchange is very common in many parts of earth.

The second aspect is that employment often involves exchange of skills and services among workers. Factory workers manufacture products so that sales rep can sell them. This is an act of exchanging two services; manufacturing service for sales rep so that they can sell, and sales service for manufacturing workers so that they can make. If there is no sales service, there is no need for manufacturing job, and vice versa. When a sales rep makes big sales, production department appreciate the sale service, too, because more sales means more need of manufacturing service. If R&D department creates good products, sales rep can easily sell more. In other words, sales reps benefit from the skills of researchers in R&D department.

This aspect of employment exchange is very important, and it enables the collaboration of differently specialized workers by exchanging their expertise. When poor workers work for rich farmers in the village of third world countries, there is no exchange of skills and services among the employees. They simply continue the existing work for their employers, and there is no collaboration with other workers. Yet, employees collaborate with each other when they work in a modern company,

which acts like an exchange machine of workers' expertise. A company is the collection of different specialists, and these different skills are used and exchanged among workers. That creates huge productivity increase. Without this, no company can produce a computer or car, and they cannot sell them globally. A company that has hundreds of clever programmers, but no accountant or sales rep, will go nowhere. Collaboration of different specialists enables the production of such a sophisticated goods and services, and this is one of the most important characters of modern company. The key to success of company, just like that of economy, is the exchange.

3-3 The causes of exchange

There are two ways to analyze the causes of exchange. At the more macro level, the exchange is explained by three factors; arbitrage, comparative advantage, and specialization. When a price is different in two places, merchants simply bring that item from one place to the other. This is typical arbitrage, and is a simple cause of exchange. Price difference is often caused by comparative advantage. Comparative advantage, simply put, is a job that a person, company, or nation, is really good at compared with alternative jobs. Concentrating a person's work on comparative advantage increases the productivity but creates the need for exchange. Suppose that a person used to cultivate wheat and vegetables, and that he has comparative advantage in wheat cultivation in stead of vegetable. In that case he concentrates his work in cultivating wheat, which makes him in need of obtaining vegetable through exchange. Specialization, caused with or without comparative advantage, creates the need for exchange, too. As a cause of exchange, comparative advantage is subset of specialization. All comparative advantages inevitably leads to specialization, but not all specialization is caused by the differences of comparative advantage. In a bakery shop, workers might purchase raw materials, bake bread, display on the shelf, sell them, and maybe keeping the book, also. If somebody has comparative advantage on baking, he would concentrate his work on it, but new worker might just be assigned for book keeping job just by chance. Either a worker become a book-keeper by chance of by comparative advantage, he specializes and collaborates with other. This leads to the exchange of expertise.

The cause of exchange at the micro-level is that humans commit exchange for the same reason with other economic activities; cost and benefit analysis. A person exchanges his banana for an apple because he feels that the apple is more beneficial than the cost, the banana. An investor might pay 25 dollar for Microsoft stock because he thinks that the future total return exceeds that money. When perceived benefit

exceeds the perceived cost, people exchange. This micro economic observation is very simple and powerful rule to explain the majority of human behaviors, including exchange.

<u>3-4 The cost of exchange</u>

There are two wheels of exchange to get it rolling. The first one is the cost. There are different kinds of cost associated with exchanging. Information gathering, understanding the other exchanging party, possibly making contract, and transporting the goods are all important process of exchange, and there are costs associated to each of them. When it is used for transport and communication, labor cost, raw materials, depreciation of transport equipments are all but some of examples of exchange cost.

Communication cost is well known but needs more analysis. The big communication cost that hinders exchange is not mailing or telephone cost, but the difference of language. This has been the largest cost, almost prohibitive, for different ethnic groups to conduct business. When merchants speak different languages, they can not negotiate the price or specify their needs. They have to spend time to learn the different legal system, measurement units, or business practice in order to carry out mutually understood trade. Throughout the Middle Age, the common language, Latin, had fostered intra-Europe trade. Similarity of language and legal system makes Americans trade with Canadians more than with Mexicans. People who can not communicate each other do not get married and form a family, or employed in a same company. So, they do not commit family or employment exchange, either. Except some rare cases[4], the exchange mainly takes place among the people with same or similar languages.

Building a trust and credit rating are another cost especially important for inter-ethnic exchange. Difference of language and culture makes it difficult for them to build trust each other. Also, credit rating can be a problem even among the same people especially when the economy is not well developed. In the thirteenth century of Japanese history, the simple form of pawnbrokers existed. People brought some valuable items as collaterals to pawnbrokers, and received loan from them. Yet, this financial business did not flourish much partially because the risk and the cost of rating credit were too high. The interest could go up to prohibitive 50 to 60 percent per

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[4] In some cases, the benefit (i.e. profitability) of trade is so big that merchants can overcome the language difference. During the Middle Age, Italian merchants were buying spices from Muslims. That was because Muslims had monopoly before the days of Great Voyage, and Europeans had serious needs of spices for better preservation and flavor of meat.

year despite taking collaterals. If the credit rating were easier, the dynamic lending and borrowing at less interest could have been possible, which had helped to develop the economy more. The easier to rate the credit, the more exchange there would be.

Transport could be more universal as a cost of exchanging than any other costs. It is important factor for both domestic and international trade. Moving an item from place to another costs money, and it can be very high when the item is big and heavy. Transport cost matters in service industry, too, because a customer has to travel to receive a service. Taking a cab to a bank is a cost, which is one reason why people open up an account in a bank near their house. A villager in deep mountain of Himalaya or remote area in Australia pay a lot of money to go to a nearest hospital, and these transport costs are parts of the total money they have to pay to receive these services. As described in many parts of this article, transport cost is probably the biggest factor to determine trade and commercial activities. Just like the villagers in Amazon, high transport cost greatly increases the difficulty of exchange, potentially making it impossible.

3-5 The benefit of exchange

The other wheel of exchange is the benefit. People commit exchange only when the benefit exceeds the cost. A seller's benefit is easy to measure and understood. It simply means profit. A buyer's benefit is usually hard to measure. When a consumer buy a pair of shoes, the benefit depends on subjective valuation of how cool and flashy they are, or how long they last. The analysis about the benefit of exchange is the major theme of this article, and it is discussed many parts of this article, notably in the previous section of "2-7 Economical development under diversity-communication model", and the following sections of "3-6 The feedback effect of exchange". Yet, here, I would like to re-emphasize on two points. One is that the exchange is the direct representation of well being and the engine for civilization. Without exchange, no individual can consume so many different items. If people can not consume, they are not defined as wealthy. Exchange is the major component of developed economy. Exchange makes it possible to develop the dynamic allocation of resources and products, and this sophisticates the economy. Secondly, the benefit of exchange increases proportionately with diversity. Diversity provides more variety of goods and services, and it is good for better consumption and also for means and inputs of production. Consuming diverse goods satisfies endlessly diverse needs of humans. Providing more choices of tools and equipment for, say, a manufacturer allows him to choose the best one, which lead to higher productivity. In short, diverse

goods and services satisfy diverse needs of consumers and businesses in more efficient way.

<u>3-6 The feedback effect of exchange</u>

The exchange creates specialization. People specialize only when they can exchange their products with others. For a society to have diverse and specialized work force, it has to have a mechanism to exchange the skills and the products of these specialists. If people or businesses can not exchange their products, there is no incentive to invest for their specialization. Also, the opposite is true and specialization encourages exchange. When people specializes their work, they have to exchange their products to maximize their income. In other words, exchange and specialization encourage each other and they are in proportional relationship. The more people exchange, the more they specialize, and vice versa.

3-6-1 Specialization increases the productivity through proficiency and comparative advantage

The specialization increases productivity. This long accepted wisdom of economics is caused by being more proficient in the specialized work. When a worker has to do different tasks, such as all production steps of hoe, he has to have different skills. He has to know from how to make handle, how to shape the blade, and to how to assemble it. When the tasks are divided to several workers, each worker keeps doing a specific task, and they will be really good at it. Also, each individual has different comparative advantage. Some are good at computer programming and others can design T-shirts better. When people specialize on the jobs that they are really good at, they can increase the productivity.

3-6-2 Specialized workers develop new products and industries, and it makes the economy as a whole more productive

When considering the effect of specialization on production, it is important to differentiate the quantity and diversity. As described in the previous section of 3-6-1, specialization increases the quantity of production. Adam Smith famously wrote that specialized labor of pin manufacture could increase productivity thousand of times. In simple task, the productivity increases the total output of same product. However, in complex work, it enhances existing goods and services, and creates new products and industries.

Specialized workers develop their unique skills and start producing improved

products, often with new functionality. Plow used to be a simple tool with just three boughs and handle. Yet, over the centuries, numerous craftsmen made a lot of improvements on this important agricultural tool. Blacksmith developed simple iron blade first, and then improved it to sharp point. That made it possible to cultivate harder soil, and led to higher agricultural production. Heavy wheels were added, and fixture was developed so that it can be pull by multiple of oxen. None of these improvements were possible without specialized craftsmen. From woodworking to bookbinding, specialized craftsmen were the center of industrial production in Middle Age. These specialists produced diverse goods with better quality and functionality that could have never been possible without specialization.

Specialization not only improves existing products but also enables to develop new industries. In modern economy, no single worker can assemble an automobile from zero to finish, or it costs astronomical money to train a worker to do so. Assembling Boeing 747 by just one worker is simply impossible, not because it takes too long time, but because it is impossible to understand the all manufacturing process. Each worker specialize his knowledge only in a specific segment of manufacturing process, and that enables the sophisticated industry. White collar workers experience the same thing. Doctors have their own specialties such as cardiology or anesthesiology, and they work together to perform surgery. IT engineers have their own fields like networking, database, or security, and no computer system would work without their collaboration. Without specialization and exchange of their knowledge, no modern industry would function. Significance of specialization is a lot bigger in complex industries and white collar workers than simple manual labor. Specialization increases the production in simple task such as making a pin, but rather more importantly it enables to create new and sophisticated industry that was previously impossible. This is the most important benefit of specialization. The collaboration of specialized workers creates new kind of product and industry. With the rise of new industries, the economy becomes more diverse. It creates the complexity of modern society.

As explained in 2-7-3 Diversity creates diverse inputs and means of production, the diversity of products and services makes it possible for workers and companies to find the best tools and equipments for their production. Modern society's high productivity partially depends on heavy equipments produced by army of specialists. Workers become a lot more productive using computers, which are produced by specialized developers. Even in less developed societies, farmers can start using different tools like plow and hoe, which usually manufactured by specialized

craftsman. The specialization creates the improved products and new industries, which increase the diversity of production. That would provide more tools and equipments for production, and eventually leads to higher productivity.

3-6-3 Specialization increases the ROI and hence number of investment opportunity

In a mono culture economy, there is only one investment opportunity; the agriculture. As the society develops and the specialization starts to develop diverse industries, the investment opportunity expands. Take a simple and imaginary example. Suppose there are three individuals, who work individually and do not exchange each other. They work nine hours a day, and spend a third of their time, or three hours, for each of farming, fishing, and baking. And also, suppose that they produce 10 pounds of wheat, 10 pounds of fish, and 10 breads for each of three hours of labor. Suppose there is fishing net in a shop, which cost 100 dollar but increases the fishing efficiency by 20 percent. If one person buys the net and start using it, he can increase the fish production by 20 percent, which is 2 pound of fish per day. This makes the return of investment of 2 fish per 100 dollar as daily rate. Now suppose that they specialize themselves into each of three productions and exchange the goods. One person specializes in farming, another does in fishing, and the last does in baking. Ignoring the increasing productivity by proficiency or comparative advantage, each individual produces 30 pounds of wheat, 30 pounds of fish, or 30 breads per day. If the one specialized in fishing buys the net and start using it all nine hours of his labor, he can increase the daily production by 20 percent, or 6 fish. This makes the return on investment of 6 fish per 100 dollar as daily rate. This is three times higher than before. However, this is not magic. It is simply caused by the fact that specialized labor use the equipment all of his 9 hours of work, where as unspecialized one use only portion of his work. This means that the utility rate of fishing net is higher, which leads to the higher return on investment.

Transport in Meheba settlement can be a real life example. In Meheba, there are some merchants who buy maize from local farmers, and transport in sum to the nearest town to sell. There are also merchants who buy simple items like soap or cloth in the town, and transport to Meheba to sell. They are simple merchants who do arbitrage trading, but that is what makes a difference from other ordinary African village. In Meheba, there is transport service by pick-up truck, mainly to satisfy this need of transport. Yet, in other villages, there are not enough merchants, and hence little need for transport. The large population of Meheba necessitates the large number of specialized merchants, and these merchants, just like specialized fisherman

in the above example, increase the utility rate of pick-up trucks. Lack of merchants in ordinary village makes the return of investing in a car so low. The specialization of merchants creates the investment opportunity of owning car, and makes operating transport service in Meheba profitable.

There is another example in Paris. There is Paris office of a company called International SOS[5]. This is a medical assistance company, which provides assistance service for its customers traveling or living in foreign countries. When a traveler or expatriate get sick in a foreign country, it can be a tricky problem. If he gets hospitalized in a developing country with different language, it could be an even trickier. This is where this company's service comes in. Customers in all over the EMEA region contact to the call center in Paris for the medical assistance. Then, the company provides various services such as referring the best hospital in the town where the customer is calling from. They can also arrange ambulance to the customer's hotel or house in case of emergency, or arrange hospitalization for critical patient. To provide these services, the company maintains a database of hospitals, doctors, or ambulance companies in all over EMEA region. They even send in-house doctors to investigate the quality and conditions of hospitals in third world countries in order to confirm the service level. Then, these data are put into computer system, so that all call center operators can search freely when they receive a call from a customer. In other words, the company invests fair amount of money into that database. This investment is justified because the company, hence the operators also, is specialized in medical assistance. The operators receive calls from customers asking for hospital referral and medical arrangements all day long, and they use the data everyday in most of their working time. Without this specialized company, the foreign patients in Syria or Congo have to find the best hospital by themselves. Just like the fishing net in the above example, the specialization of the company makes the utility rate of the database higher. This is one of the main reasons to justify that investment and the specialization of the company in medical assistance created this new opportunity of investment.

3-6-4 Specialization increases the size of economy, and that stimulates another specialization

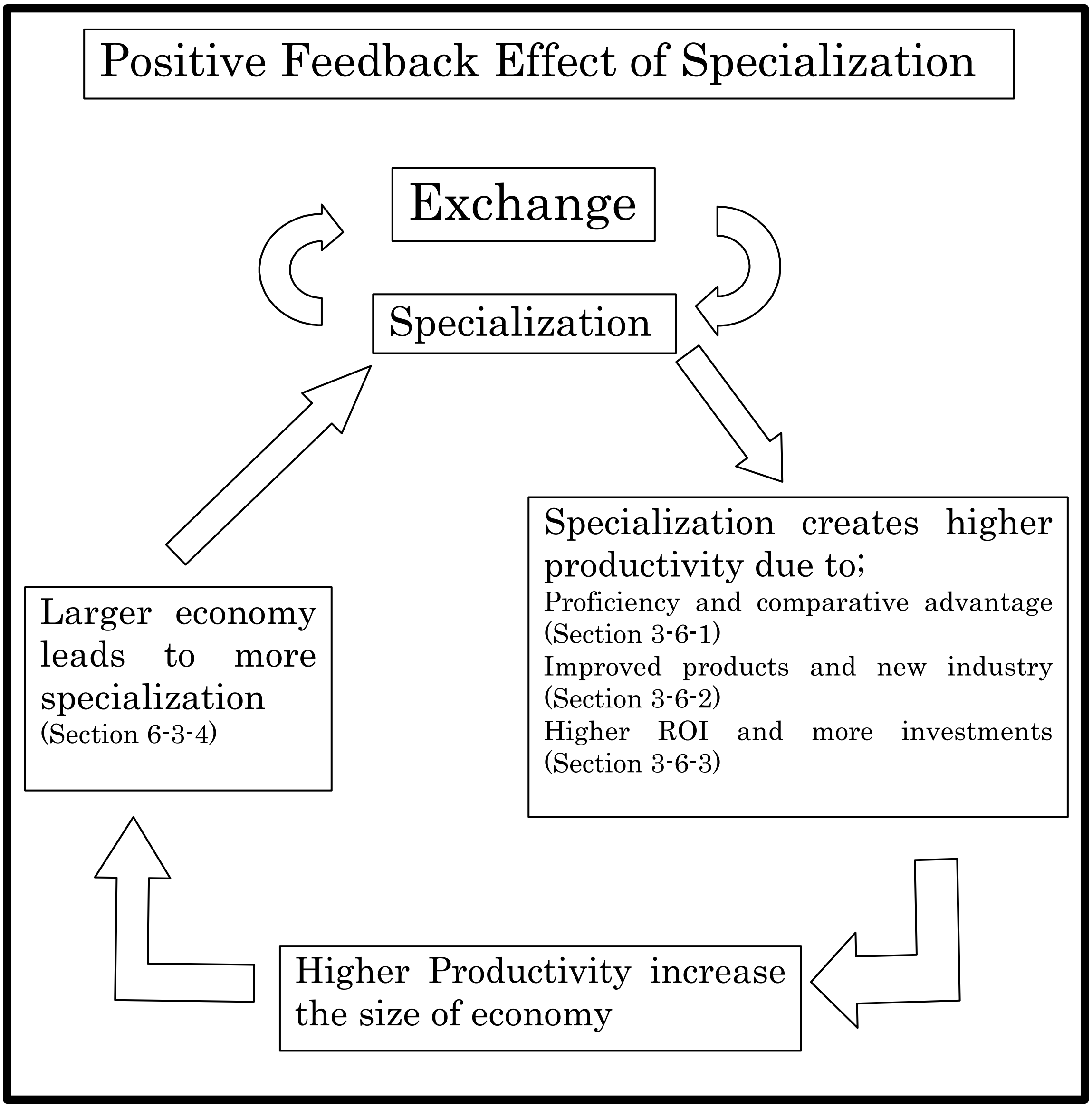
As explained in previous sections, specialization increases the productivity by proficiency and comparative advantage, and this increases the total production of

[5] I worked in this company about a year, and that was how I obtained the knowledge about the operation of this industry. However, there is neither personal nor financial relationship with this company after terminating the working contract.

same products. Specialized workers improve goods and services, and they are the main engine to develop new industries. Diversified production creates more tools and means of production, which increase the productivity, too. Also, specialization increases the investment opportunity. Through investing in new opportunities, the economy as a whole can benefit more returns, and it can increase the size. In other words, all of these effects of specialization lead to larger size of economy. Here, it is worth to re-visit the famous economic principle of Adam Smith that the specialization is limited by the size of economy. When economy is small, there would not be a market big enough to demand a full production of a dedicated individual. That is why there is no meat shop, or transport service, in many of African villages, or grocery store in Scottish village in 18th century. This principle is true at larger and more sophisticated economy. Long time ago, a grocery store was often owned and operated by one person. Yet, as the economy became larger and sales increased, the shop started to employ people. The owner started to do only some specific tasks such as book keeping, while an employee worked in the counter. If the sales increased more, the shop might have more branches and employ several more workers and some supervisors. As the economy and sales develops even more, the stores would have different divisions such as merchandising, marketing, shop operation, and accounting. When the sales were small, the demand for marketing or accounting was not big enough to support the dedicated and specialized divisions. However, the large sales created the need of different divisions and specializations.

The quantity and diversity of equipments they use increases also. First, they might have had difficulty to buy even a car to transport merchandise. After they become bigger, they can buy cars and trucks specifically suited for their transportation needs. Cash register used to be just a box with calculator function. But in modern and bigger stores, their cash registers are connected to a computer, and the sales data is stored and processed in large volume. Software companies like SAP and Reek sell specific and sophisticated software especially developed for data processing of retailing industry. All of these examples show how, as an industry become bigger, the size of associated industry also become bigger, which leads to, again, another specialization.

In short, the whole process has a positive feedback effect. Specialization increases the size of economy, which in return create more specialization. This feedback effect is the major reason to explain the difference between rural societies and civilizations in history or between poor countries and rich ones today. From next chapters, I would like to explain how this feedback effect took place in various stage of human history.



Chapter 4
Historical Development of Exchange

4-1 Overview

Until this previous chapter, this article was discussing the economic principles of exchange and how these principles shape the economic system. This chapter would explain how the principles of exchange actually influenced the economic

development in the different stages of history. This article categorizes human history by rather unconventional way. Broadly categorized, there are three stages of history in terms of how a society conducts the exchange; city trade, regional trade, and global trade. At the first stage humans formed city and started exchange by living close to each other. When people lived scattered, it cost a lot to exchange goods, and very few exchanges was taking place except some items within a village. But once cites, or concentrated settlements, were formed, people started to exchange a lot of goods within these cities. Concentration of population increased the exchange and that was the beginning of civilization. Then it came the long distance trade, or regional trade, and humanity expanded the geographical coverage of exchange. This was well shown by the Mediterranean civilizations. They used maritime transport, which was more efficient than over land, and established colonies all over the Sea. By doing that, they created a huge economic zone that no humanity ever achieved. This large size of economy enabled higher specialization and sophistication of economic system. This stage continued till the Middle Age. Although the Middle Age is considered as separate era by conventional political historians due to religious and political structure, it was doing the long distance exchange by ships, which economic range was similar to Mediterranean type. Economically speaking, they fall into same era. The third stage is the global trade and rise of modern capitalism. City based civilization and long range trade were achieved in other parts of the world also, but only Europeans moved to this stage of sophistication. It strongly associated with development of financial industry and global trade. The Age of Exploration created globe wide economy, unprecedented in human history, and necessitated equally large business operations. Banks created fluid allocation of money, and enabled to finance large and swift business maneuver. Insurance provided risk management for large size of investment, and stock financed company enabled to collect large amount of money and create global enterprises. These big business organizations enabled to do business in a huge market, including colony management and global trade. Chain of innovations took place during industrial revolution, but few of these would have been fully materialized, or may not even occur, if there was no market large enough to require such a high level of production. In this chapter, the historical development of exchange will be discussed with more details.

4-2 Exchange by high population density: City based civilizations

4-2-1 Social surplus and exchange

It has been long argued that social surplus was the major causes of ancient civilizations. Social surplus is the surplus of food production more than the consumption by the farmers. The social surplus theory says that non-farmers like craftsman or politicians, who are fed by social surplus, are the source of social and technological advancement. Yet, this theory shows only one side of society. Take one simple example. Suppose that society A has three persons, each of who produce wheat, fish, or vegetables, and they exchange each other. Also, suppose that society B has three persons also, but they produce wheat only, so do not exchange. Suppose that society B has social surplus of one person's consumption, so only two of them produce and the third one depends on the social surplus. In this example, people in society A consume diverse foods, so the nutrition is better, where as people in society B can consume only wheat, which might cause malnutrition even if they take enough calories. Again, diversity and exchange makes people's life better in society A than society B, despite its social surplus.

Social surplus theory also depends on some assumptions. First, it assumes that more number of non-farmers means more development, without considering the efficiency of this class. However, the efficiency of innovation is different by society, and more number of non-farmers does not necessarily mean more innovation. Non-farmers might produce innovations, but they sometime restrict it, too. If the bureaucrats and nobles dictate a society too much, for instance, the society will be less free and dynamic, which restrict the innovation. Even though more non-farmers might produce more development, it is wrong to assume that they always do with same efficiency. Also, social surplus theory assumes that agriculture class does not improve technology or social system, yet, in fact, they do. They work together to construct agriculture infrastructure, such as irrigation system. They often improve agricultural practices for themselves.

Even in a case where social surplus helped social development, the causes of it is questionably attributed. One assumed cause of social surplus is the fertile farming land. Most of ancient civilizations were developed at the downstream of big rivers. Egypt, Mesopotamia, Indus, and Chinese ancient civilizations are all good examples. The theory says, the rivers brought fertile soil to the fields, and the agriculture productivity increased. Surely this could be part of the explanation, but it fails to explain why there were so many civilizations in without fertile lands. Ancient Greece or even Roman Empire did not have so much fertile lands. Many Latin American civilizations, like Maya or Inca, were developed in the jungles or mountains. Also, the theory does not explain why the ancient civilization did not develop in other fertile

lands, such as Mecon delta region of Vietnam.

Social surplus theory focuses on non-farmer class as an engine for social and technological development. The theory has some nice perspectives, but it only looks at one class of society and does not show whole picture. The development of civilization should be explained as total of society, and population could be one of the important indications to look at the totality of society.

4-2-2 Large population, or large economy, caused civilization

The productivity of land, (i.e. the output per area, which usually means higher social surplus) was important in any ancient communities, but it was not the primary cause to develop sophisticated society. No matter how much fertile the land was, it could not support large population if the area is small. Rather, the total area of cultivatable land was more important because it could support more population. More population meant bigger size of economy. Higher agricultural production was important, not because it could support more non-farmer population, but because it increased the total population and creates bigger market. Large cultivable land created ancient cities.

As many historians noticed, the birth of city was the first revolution humanity ever experienced. It changed every aspect of human society, and exchange pattern was not the exception. Before that change, all human being lived in villages scattered around the continents. The communication and exchange were mostly limited only within a village. Furthermore, the people in these villages were socialized in a same way, so did not have so much different thinking or behavior. They also produced almost identical products. All of these homogeneities made it less practical and beneficial to exchange.

When a large number of people started to live in a concentrated area, the cost for exchange decreased significantly. The biggest source of saving comes from the transport cost. In villages, it might take days to go to next village, and it was often impossible to transport merchandise, which could be heavy and bulky like crops. Compared with that, transporting within in city was almost negligible. People living in a concentrated area also developed commonly understood rules and languages. That helped to reduce the communication and transaction cost for conducting businesses. These reduced costs encouraged exchange.

More population meant more probability of innovation in both agriculture and non-agriculture. Suppose that there is a city with population of 20,000 and a village of 200. Assuming that the both people have same creativity, the city is likely to have

more innovation from its own population than the village. All other things equal, this city would have 100 times more innovations and improvements than village. This is because having more people means more probability of having innovative individuals within the population.

Also, more population meant large size of economy, and that increased specialization. Suppose that there are 50 people in a village and ten percent of them really love wine. But the demand of 5 people would not be enough to specialize as a job of one person. However, if 50,000 people live relatively close, the same ratio of wine consumer as in the village creates a demand of 5000 people, without considering other sophistication of society. This is large enough to make a few people to specialize to wine production. That is the one and probably the biggest reason why ancient Egyptians, who were one of the first ones to live close in city, started wine production by specialized workers. They also had many other specialized craftsmen such as leather tanning and woodworking. The birth of these specialized workers was caused by the large economic size.

Increase of commercial activity influences agriculture in positive way also. The opportunity to sell their crops gives them a big incentive to work harder and improve their practice. In modern society, agricultural technologies are invented by other than farmers. Chemists invent chemical fertilizer, and engineers make large agricultural equipment. However, in ancient times, it was often farmers themselves who played important roles to improve agricultural technologies and practices. It was them who provided the labor to construct irrigation system. They started the field and crop rotation. With higher food production, the society could support more population, which meant even large economy.

The whole process of interaction between increased economy size and specialization is the same as described in 3-6 The feedback effect of exchange. When the size of economy increases, the specialization would be more intense. Specialization itself increases productivity, investment opportunity, and diversity of industry. In the end, all of these effects of specialization give positive feedback to increase the economy size. This process, explained several times in this article, is the major cause of civilization.

4-3 Regional exchange by efficient transport: Mediterranean Civilization and the Middle Age

4-3-1 Exchange Cost Adjusted Population Density (ECAPD)

As discussed many times in this article, the size of economy is the key factor for social and economical development. However, to determine the economic size is not easy task. In modern age, the size of economy is calculated as all of economic activities within a country, and a country is considered as one economy. There are several reasons for this. The policy makers need national economic date to make their decisions. The citizens are interested in the economic data of their own country. The most of economic activities take place within a country, and the share of international trade in GDP is usually not so big. All of there make the national definition of economy size important in a society. However, it is not the only way to define economy size, and boundary of economy does not need to coincide with boundary of politics.

More people oriented approach works and digs into the truth more. As a tool to formulate the new definition of economy size, this article uses new approach of Exchange Cost Adjusted Population Density (ECAPD). This approach looks at the population, not within the just given geographical area, but within the area determined by a unit of exchange cost relative to the income. It is the population density of people accessible for exchange by spending a certain ratio of exchange cost[6] to income. Take ten percent of annual labor as a unit of exchange cost, for example. In modern society, ten percent of annual salary, say 5000 dollars, makes it possible to exchange with a lot of people. This is because better transport and communication technologies reduce the exchange cost, and enables to exchange with people of distance. With 5000 dollars, one can call a company to sell or buy a load of wheat, and send a truck to a city on the other side of country to transport it. ECAPD is the population density within the reach of 5000 dollar of exchange cost, in this case. On the other hand, ECAPD of ancient time, or rural area of developing countries today, was lower. Ten percent of annual production, which could be, say, 40 pounds of maize or one goat, was not a lot. Also, the exchange cost was relatively high due to less developed transport technologies and infrastructures. So, paying 40 pounds of maize did not allow him to reach a lot of people to exchange with, and that is why the exchange was often limited within a village or city. In other words, in modern days there are a lot of people to exchange with by spending ten percent of annual production, where as there were a lot less people within the same ratio of exchange cost in the past.

High ECAPD society allows its people to exchange more because high ECAPD means more people living within the reach of certain exchange cost. In other words,

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[6]This includes all of exchange cost described in 3-4 The cost of exchange, such as communication, transport, and transaction cost.

ECAPD is essentially a good approximation of the size of economy or market. It tells how many people exist to sell a product within a unit of exchange cost, and how much production capacity, from individual craftsman to factories, exist within that area. The ECAPD is the size of economy within the boundary defined by an exchange cost. This is whole different approach from conventional one, which determines size of economy by boarder. Political boundary is irrelevant for some economic analysis because it may not represent the economic boundary. For example, Indian national economy is about ten times bigger than Belgium economy. This is simply because there are more people living within the boarder of India than that of Belgium, but it does not mean Indians individuals exchange more. Many Indians are living in rural area, where transport is not well developed. They engage in subsistent agriculture and exchange only a portion of their production. The production level is low, even for many urban residents, so they can not spend so much money for the cost of exchange. On the other hand, Belgians exchange and consume goods and services from the world such as software developed in US or TVs made in China. Usually economic boundary of rich countries is bigger than political one because they can exchange with foreign countries a lot, while that of impoverished people in third world countries tends to be smaller than the national boundary because they exchange only within a village or surrounding regions. The developed societies have better social and technological infrastructure, so it makes exchange cost lower. Also, higher income means that the same ratio of income become higher. This enables people to access and exchange with more number of people.

This article argues that large size of economy benefit society. Yet, large economy here is not defined by conventional political borders. Large economy means the total amount of exchange within the economic boarder, which is defined by ECAPD. Benefit of large economy is proportionate to higher ECAPD, but not to bigger national economy.

4-3-2 Higher ECAPD caused by long distance trade

In ancient civilizations, ECAPD and geographical population density was not so different, if not identical. This is because, back then, transporting goods to other cities was so high that the exchange took place almost exclusively within a city or village. However, this was changed by extensive use of long distance trade. The first people who started the long distance trade was the Mediterranean people, who include, Phoenicians and Carthaginians, but more famously Greeks and Romans. Many of them established colonial cities and engaged maritime trade in all over the Mediterranean Sea. Ancient Romans followed and established the empire. Romans

were famous for well established political and legal system and extensive constructions in many parts of the empire. Yet, they dominated the Mediterranean trade also, and the enhanced mechanism of exchange can not be ignored for their development.

The flourish of Mediterranean trade was caused by cheap maritime transport. Ships can transport more goods, with less labor, and within shorter time period, compared with land transport. Superiority of ship transport over the land is well observed. Fernand Braudel estimated less cost and higher speed of sea transport compared with the land transport in 16th century Mediterranean, and Adam Smith wrote about the transport cost of 18th century in Great Britain. Smith estimated that less than ten sailors could transport so many goods that required hundreds of labor and horses if it were to be done over land. Around 17th and 18th century in Japan, most of transport was taking place by ships. Considering that Japan is small and land transport could short cut to travel much less distance, the advantage of maritime transport was evident.

The reduced cost of transport was accompanied by reduced cost of communication and understanding in Mediterranean Sea. Generally speaking, when people commit trade with foreign people, they have to pay higher communication cost. They have to understand different language, different custom, or different legal system. However, these costs were not so high for the Mediterranean people. From Phoenicians to Romans, establishing colonies all over Mediterranean was their standard practices, so the cultural and social differences were kept minimal. So, as long as trading with the colonies of same people, there were not any linguistic or legal problems. These were the biggest differences from the days of Ancient Egypt and Mesopotamia. As some source indicates, including the Bible, there existed some exchanges between the two civilizations. However, that trade was not big in amount. The transport had to rely on land, and the social and legal difference made it difficult to engage in exchange.

When the Mediterranean Sea had become more integrated economic zone, the effect was even larger. Greek became the standard language, and even the non-Greek peoples, especially traders and educated, spoke it. Roman aristocrats took ownership of farms in North Africa, which indicated higher economic integration than simple trade. The wines, made from the grapes of Greek farmers, were transported to all over the region. The production of amphorae, a unique jar for transporting agricultural products and wine, increased as the trade increased. Then, clay for jars became one of the traded goods in order to supply amphorae production. Woods were trade also for

ship building. Thus, chain reaction of trade started. As described in 3-5 The benefit of exchange and 3-6 The feedback effect of exchange, the exchange and large economy stimulated the specialization, diversity, productivity growth, and investment opportunity. Large Mediterranean economy benefited from all of these effects.

4-3-3 Trade with high ECAPD in Middle Age

Politically and socially speaking, European society in the Middle Age is separated from Roman Empire or Greek civilization. They were different in a lot of social and political aspects. Yet, the cause of trade, especially at later half of the Middle Age, was similar to these Mediterranean economies. There were two origins of trade in Middle Age Europe. One was from the south. Venetians signed a commercial treaty with the Saracens in 991 A.D. and initiated trade with them, and their dominance in east Mediterranean trade was established after the Crusades. The one from the north started with establishment of Lubeck, which later became the center of Hanseatic League. The commercial alliance of northern cities dominated the trade in Baltic and North Sea. The Italian trade focused on trade with Muslims and not really with western Mediterranean, while merchants of Hanseatic League mainly traded in northern Europe. Navigation technology was not so different from before and they did not extensively use any new organizations such as banks or large enterprises. Just like Greek or Roman times, the trade was largely regional or intra-Europe at most. High ECAPD through maritime transport was the main engine for trading. Although Middle Age Europe was different from Classical Civilizations, the scale and mechanism of economy were at the same level.

<u>4-4 Exchange by global transport and financial instruments: Modern Capitalism</u>

Just as previous two stages, the last stage, or modern capitalism, did not appear over night. It started and expanded its influences slowly but steadily. Yet, if it was to be marked as the beginning of modern capitalism, it should be the first voyage of Vasco da Gama. The Portuguese navigator was the first European who arrived Asia going around Cape of Good Hope. His voyage initiated two of the biggest engines for the early phase of capitalism development; spice trade and colonization. He came back from India with full load of spice, which made Lisbon a sort of European center for spice market. Being as valuable as precious metals, the spice was the main motive for many historical events of that time including Christopher Columbus's voyage and the establishment of first stock corporation, VOC. Da Gama's voyage was first of these. He also colonized parts of Mozambique and southwest of India. At first, colonization

was small and did not have as big impact as spice trade. However, later it became the main force for the world economy, even after spice impact waned.

The change that spice and colonization brought was, simply put, the emergence of global economy. Unlike the trade of the Middle Age such as Hanseatic League in North Sea or Muslim in Indian Ocean, the spice trade was carried out at the global level. Colonization also created the global market for many goods and services. As the world economy being integrated more and more, the scale of commercial activities increased. It started to require more ships, merchants, and soldiers. It needed a lot of capital to build forts and trading post. All of these necessitated sophisticated resource allocation in order to manage large scale commerce. The following sections will describe how the enlarged economy and the development of modern capitalism interacted each other.

4-4-1Large market necessitates large resource and risk management

The exchange has been increasing throughout human history, not only by producing more of the same products, but by invention of new products to exchange. In ancient times, farmers cultivated with simple tools, and they were exchanging a bit of their crops. When iron hoe was invented, the craftsmen and merchants started business out of this, and by using hoes farmers increased their production. The exchange of hoe started and the exchange of crops increased due to higher production. When the ancient Greeks expanded ship building industry, the exchange of ship started, and the trade also increased due to better and cheaper transport. In other words, invention of new products often increase the exchange in two ways; one by the increase of exchange by itself, hoe in the above case, and the other by the side effect of increased productivity, such as crops exchange enabled by higher agricultural productivity.

The invention of financial products and services were the same. For a long time in history, businesses were owned by individual or family. When a stock company was invented and stocks started to be exchanged, the total exchange in a society increased in two ways. It increased the selling and buying of stock itself and it increased the total exchange of the company, such as sales of goods, purchase of raw materials and employment or labor, due to large capital collected in form of stocks. It is important to note that the demand for financial products is, just like any other products, proportionate to the size of economy. When economy size was small, the production was small, and when production was small, the required resource for production was small. The banks and other financial services existed for thousand of

years in many parts of the world. The temples in Babylonia provided loans as early as four thousand years ago. The Greek temples served as safe-deposit of valuable items for the worshipers. But the banking industry did not grow because the demand of monetary services was not so high due to small size of production and economy. When economy got larger and started producing more, required resources got larger, too. The increased trade puts the banking and other financial services in greater needs, which, in return, enhanced the trade. The financial services facilitated the trade and the trade expanded financial industry.

The increase of financial exchange benefits society in two ways; resource allocation and risk management. Banks put together large amount of money through deposits, and invest into businesses. In doing so, they are acting as a kind of resource broker, who allocates money into profitable projects on behalf of depositors. The banks also manage risks. They evaluate the credit of the debtors to reduce the risk of default, and even if the debtor goes default, the damage to each depositor is limited since banks slice up and spread the risk by gathering money from many depositors and investing in many projects. Insurance, just as commonly understood, limits the damage of unexpected events. Individuals or enterprises often keep some portion of their assets in order to deal with these unfortunate events, such as death and shipwreck, but insurance releases these assets of safe hedge and allows them to use in better way, both investment and consumption. In other words, the direct benefit of insurance is risk hedge, but it indirectly allows better resource utilization. Stock corporations do the similar. It allows slicing up the stake and ownership, and distributing to large number of stock holders, which enables to limit the risk of each stock holder. By combining these sliced investments, stock corporations enable to form huge companies such as Dutch East India Company or GM, which no single investor can afford to create. In other words, from banks and insurance to stocks, financial products provide the society the greater choices and sophistication for resource allocation and risk management. The next three sections will explain how the rise of global economy and development of financial industries are related.

4-4-2 Rise of global economy and banking industry

The precedent of modern banking was first created in Italy. Italian bankers such as the Medici family provided foreign exchange services and lending money for the traders. Foreign exchange service was very beneficial for traders. By changing one currency to another, they could allocate their capital more dynamic way regardless of boarder. This led to better allocation of resource. Lending money was another

important component. Some said that capitalism was created by accumulation of capital. But to be more precise, it was dynamic allocation of money, not accumulation, that developed capitalism. No matter how much accumulation of capital a society had, it could not develop itself if the capital was not utilized wisely. On the other hand, a society grew steadily even without having large capital at the beginning if it could utilize capital in beneficial way. They key was allocation of resource. Banks collected deposits and allocated to profitable projects. This resource allocation mechanism enabled society to develop more in long term.

There was some form of accumulation or concentration of capital outside of Europe also, but they were not associated with dynamic allocation. At the beginning of 15th century, the Ming dynasty of China initiated a large scale voyage, led by an admiral Cheng. The fleet was consisted 62 ships with about 27800 crews. Admiral Cheng made 7 voyages to many parts of Southeast Asia, India, the Persian Gulf, East Africa, and Egypt. This was large scale deployment of capital compared with Columbus' voyage, which consisted with three a lot smaller ships with about 90 crew, or Magellan's voyage, which consisted with five ships, also smaller than Cheng's, with about 250 crew. Even though Ming dynasty initially utilized more resources for large scale voyages than Europeans, the expeditions were controlled by nobles and bureaucrats, and they were not commercially motivated. The state sponsored the voyages for political motive, and the expeditions were stopped later. Contrary to Cheng's expeditions, it was banks and business organizations that, directly or indirectly, financed the large portion of European voyages. The syndicate of Genovese bankers financed Columbus' voyages and the House of Fugger, the German bank house, did Magellan's. Many of European voyages were commercially motivated and profitable indeed, so they never stopped. These were good examples how sophisticated banking industry enabled dynamic resource allocation and consequently improved society more.

4-4-3 Rise of global economy and stock-corporation

Dutch East India Company, Vereenigde Oostindische Compagnie or VOC in Dutch, was created 1602. Six chambers of Netherlands, each of them acting like syndicates, sent delegates to the company in proportion to the capital that they contributed. This was the beginning of new way to finance and own a company, and at the same time to hedge the risk associated with it. Investors invested only a portion of a company, so they were taking limited stake and risk in it. This allowed them to form a large enterprise that was never possible to create by an individual or even state. At

the height of VOC history, this trading company owned 150 merchant ships, 40 warships, and 10,000 soldiers, operating from the Cape of Good Hope, Iran, India, Southeast Asia, China, and Japan. The advantage of stock-corporation was large and many other European countries, notably England and France, had followed to establish the similar enterprises.

The rise of corporations increased the diversity of goods traded in international commerce. These corporations were given the right of monopoly over the land it acquired, and they operated as globally as any multinational companies do today. The expanding geographical limits of trade simply meant increased ECAPD. Through better ship building technology and discovery of new maritime route, it became possible to travel further with same cost or less. Within the reach of these ships, billions of humans lived, produced, and consumed different goods and services. Just like any other time when ECAPD increased, the economic diversity and the diversity of traded goods increased. Through colonization process, the Europeans traded various goods from precious metals, equally precious spices, even to live humans as slaves. Spanish conquered large parts of Americas and obtained, or often robbed, gold, silver, and other metals like copper from native people. African slave started to be traded from the beginning of the era of Great Voyage, and kept growing as the economic size and demand for cheap labor increased in the new continents. VOC's main source of profit was spices, which was literally valued equal to gold. Spice, which grows only in tropical climate, had been the precious condiment for Europeans, and it was monopolized by Muslim and Venetians for centuries. The developed navigation and ship building technology allowed Europeans to reach the Southeast Asia directly, and high concentration of capital collected by stocks enabled the operations of companies to be large enough to monopolize the market and supply large portion of the demand in Europe.

There was another associated factor for these trade expansions; the large market to sell these diverse products brought from the world. Since Middle Age, the Europe became more like one single market. With similar language, especially Latin, religion, and customs, intra-Europe trade was common and carried out by many alliances and organizations, from famous trade Hanseatic League to various trading houses. Domestic tolls and tariffs were kept minimum allowing goods to move freely. Many European cities were established on the coasts or the river banks. This was good indication that the better access to efficient water transport for trading was important factor for city development. VOC invested tremendous amount of money to establish chains of trading posts and forts and to hire employees. This was because

they could sell spices to entire Europe. If they could sell only in Netherlands, the establishment of VOC would have been impossible. The same is true for Spanish treasure from the South America. The gold and silvers were brought back to Spain, but once in Spain they were traded with numerous goods from other parts of Europe. If Spain was isolated from other European economies, bringing back so much gold would have caused stiff inflation only and would not have increased the trade or commerce. The Europe was one big single market, and that was why bringing back merchandises from the other side of planet became possible. The slavery market developed with same principle. First slaves from Africa were brought to Portugal since they lacked agricultural workers. Yet, the slave trade really took off after large scale plantation in the new continent started. Developing large scale plantation of sugar cane, and later cotton, required equally large deployment of labor. It was this huge demand of labor in the thriving colonies that increased slave trade. Just like gold and spices trade flourished by the large market in Europe, the slave trade increased as the demand from plantations grew. The size of company is related to the amount of trade, which is proportionally related to the size of market. Hence, the bigger the market is, the bigger the required capital. The large markets necessitated the sophisticated way to finance the company.

The increased ECAPD created high trade volume, and to handle it the company needed large work force. This put the employment exchange at higher level. At the height of its operation, VOC had 50,000 employees. Many other stock corporations had comparable scale of operations. These were enormous organizations at that time, and employment exchange became very sophisticated. Many of them had different roles and specializations, and exchanged these expertise. Soldiers protected sailors, and sailors transported the goods for the merchants to sell, who handed the money to accountants. These employees cooperated and exchanged their services each other in order to make profit of company in exchange for the salary. This sophisticated intra-company employment exchange enabled to create profit generating organizations for the sake of stock holders.

4-4-4 Rise of global economy and insurance industry

Just like other financial products, insurance was not used by the Europeans first. A kind of risk sharing scheme for maritime merchants was specified in the Code of Hammurabi of Mesopotamia, the oldest written laws in history. Phoenicians were practicing similar scheme, too. A lender financed a merchant's voyage, and the merchant was obligated to repay the debts plus an interest when the voyage was

completed. If the ship got wrecked, the lender canceled the debt. This simple but important risk management became popular and spread to many parts of Mediterranean and Asia by 3rd century AD.

However, modern insurance did not emerge until late 17th century, and this was, again, related to the expanding size of economy and maritime trade. Trading ships had high concentration of capital. Ships were expensive and they were loaded with full of merchandises. Any misfortune, wreckage or pirate attack, could lead to the loss of everything. This concentration of capital and risk necessitated risk management. The traders, ship owners, and captains, gathered at Lloyd's coffeehouse in London (which itself originally came from Islamic world, being a testament of globalization), and negotiated the marine insurance with the brokers. In those days, London was the center of maritime trade, and the need for limiting the risk was the highest. Merchants and ship owners wanted to hedge the risk of shipwreck or assault from pirates. Today, buying insurance would be the quick solution, but there was no formalized policy back then. What these merchants did was to negotiate with brokers, who sliced up the insurance risk and found sufficient number of wealthy individuals, or Names, to take each of these pieces of risks. One of the important skills of the brokers was to evaluate financial integrity of these individuals who take the policy, because if they did not have enough assets, they might not be able to pay the insurance in case of damage. In other words, the brokers were working as an intermediary of two risks; one was the risk of ships or cargoes being lost, and the other was the risk of the Names not being able to pay the insurance.

In normal business environment, efficient businesses thrive and inefficient ones go out of business. In maritime trade without insurance, unfortunate merchants went out of business due to wreckage or pirate attacks, and fortunate one thrived regardless of their efficiency and profitability. Insurance contract could take maritime trade back to normal environment by transferring the risk from the merchants and ship owners to the insurance undertakers. This helped to improve the efficiency and productivity of the industry as a whole by allowing only efficient merchants to thrive. Also this was good for the individuals who took the risk. These wealthy people had financial capacity to take extra risks in search for higher returns. They could diversify their portfolio into this different kind of investments. Insurance, by providing more choice for hedging risks and managing assets, helped economy as whole to be more efficient.

4-4-5 Industrial Revolution

Rise of financial industry and the development of global economy were deeply connected. Global market necessitated large and sophisticated resource allocation, and just by satisfying that need the financial industry helped the rise of global economy. These two influenced each other, and one could not have advanced without the other. Development of mass market and the industrial revolution were somewhat similar also. Only large market required mass production, and mass production was fundamentally connected with technological innovations. In that sense, the main social and economic principles to propel the Industrial Revolution was similar to the ones for the Age of Exploration and subsequent economic development, and the size of market, resource allocation, and technological development interacted each other. That created active commerce and exchange, which led to economic and technological development. Yet, there were two developments worth to note this age of innovation.

The first new development was establishment of patent law. Patent had been existed for centuries. In 1449, English King awarded first patent protection to a Flemish man for his invention of stain glass manufacturing. Italian also had Venetian Statute in 15th century that provided legal protections for new and inventive devices. However, it took some time to put into full and good practice of that law. English Crown used it as a source of revenue by only granting patents to the people who were willing to pay. Yet, after a lot of time and political struggle, the law put into better practice. Required specification was raised at the beginning of 18th century in order to clarify the innovations. This led to the void of Arkwright's patent of spinning machine due to lack of specification, but probably helped to protect the patent of Watt's steam engine, which was improvement of existing machine. All of these improvements of patent protection, not existed in the Age of Exploration, encouraged innovations. As Abraham Lincoln once stated, the patent system fuelled the fire of genius. Patent, providing monopoly right for innovation, increased the return of investment made in forms of either corporate R&D or individual efforts for innovation.

The effect of patent and profit guaranteed by it should never be underestimated. It was not advancement of science but the pursuit of profit that propelled Industrial Revolution. Arkwright invented spinning machine, but innovation was not only his talent. He formed a company with Jedediah Strutt, another inventor, and proved his skill of factory management. Locomotive was developed by the series of rather small inventions made by various railway companies. These companies kept inventing new methodologies and improvements, and that was because they knew they would make money out of the business, not because they had scientific curiosity. Thomas Edison's inventions were put into practice by many profit

seeking companies, which included General Electric, the company established by himself. Henry Ford would be another and better example. His innovation of line manufacturing was one of the greatest in the last century. Yet, he did not establish his company in order to prove the efficiency of his new manufacturing method, but it was just the opposite. He created the car manufacturing company in the pursuit of profit, and the line manufacturing was just a byproduct of his challenge. All of these individuals and companies that led the way to the Industrial Revolutions worked hard to put these innovations into practice, and the profit from these innovations was inflated due to patent protection. Surely the science was important, but the commercially motivated innovations, protected by patent, were the more direct cause of industrial revolution.

The second development was the improvements of short and medium range transport, which intensified the mass market at domestic and inter-city level. Global trade has been existed since the days of VOC. The history of intra-Europe trade conducted by commercial alliance of city states and trading houses was even longer. Yet, what was new to the days of Industrial Revolution was radically reduced cost of short and medium range transport. Canal was built to transport heavy materials and finished goods. Later 18th century and early 19th century were the high time for British canal development, and approximately 7,000 km (or about 4,000 miles) of canals were built during this time. Before the canals were constructed, horses and carts on uncovered road were the main ground transport. It is estimated that the canal boats increased the transport capacity more than ten times in terms of weight. The Bridgewater canal, which was the first canal built during that time, reduced the price of coal by almost two thirds. The development of locomotives, replacing the canal system, even intensified the increase of transport efficiency. First started as a mine transport, the development of train was very quick. In 1829, the first locomotive that carried both passengers and freights was put into operation in England, and the next year, America started the same with bigger American made engine. Since then, the improvements in railway system had been made almost every year, and the continental Europe quickly followed the trend. The canal and train reduced transport cost of short and medium distance, and this intensified the inter-city trade.

This was yet another expansion of ECAPD. Through canals and railways, goods moved more among cities. The surge of production capacity created mass market during the Industrial Revolution, but the high production would not be needed or used if the mass transport were not developed. High production necessitated efficient transport, and vis versa.

4-4-6 Financial Revolution and mass resource allocation

In most of the time in human history, the cost and benefit of exchange determined the total amount of exchange in a society. Farmers sold their crops in a market, or traders transported merchandise from one place to the other. The factors for these kinds of ordinary exchange were simply the benefit of goods and the cost to deliver them. The bigger the benefit and the smaller the cost, the more exchange a society would have. This had been the simple but very crucial principle to determine the total exchange. Also, at that time, the person who conducted the business was the same with the person who finance it. Basically only the wealthy people were doing business with self financing.

However, since the days of the Great Exploration, large and accurate resource allocation, enabled by financial industry, had become another and even more powerful principles of exchange: the age of mass resource allocation arrived. The most crucial impact was that the person who executed the business started to be different from the one who invested into it. The most historic moment of this was when Christopher Columbus secured the finance from Isabella I, queen of Castile, and, less commonly known, from Italian investors. Being merchants himself, Columbus made sure that he would receive a portion of profit to be made from Asia, where he thought he would arrive and trade with. Magellan's voyage was also largely motivated by commercial returns. With no doubt, they were great explorers. Yet, these voyages were not realized without expected return that these investors were looking for, and hence were not the type of exploration that many European explorers did for geographic and scientific motives later in the history.

As the economic system developed over the history, the financing became more sophisticated. Stock corporation emerged, and different types of banks started to offer different forms of finance, just as described in previous sections. From the textile industry in the First Industrial Revolution, to development of car industry in the beginning of 20th century, and to recent development of IT and pharmaceutical industry, sophisticated resource allocation always fueled the engines of industrial and technological development. This benefited society as a whole through the rise of new industry. Investors poured money into profitable business, but closed the faucet of cash to loss making companies. This enabled dynamic development of economy. Profitable business flourished and increased in a society, while loss making business disappeared and released the resource of production, such as labor, land, and many forms of financial assets. If there were not stock based finance, VOC would never have

created. Development and deployment of railroad would have been extremely slow, or not been even possible, if these companies had to rely only on self-financing.

This separation of executor and investor, and subsequent development of financial industry, was big move for three reasons. First, it created critical form of specialization, and this specialization made the both of them more efficient. The executors and entrepreneurs are the ones who know how to manage businesses, or the ones who have innovative idea for new ventures. The investors are the ones who have money, usually being bankers or wealthy people. The executors specialize in business management and investors specialize in cash allocation and risk management. By specializing, both improved the skills and productivities. Second, by separating the two, it gave more choices and freedom for them. Before, the executors had to have money to invest themselves, and the wealthy people had to own and operate business to make profit. Yet, by separating, the investors started to have freedom to concentrate or diversify their investment among many opportunities. The executors began to use different types of money to finance their business, such as bank loan, stocks, or bonds, and all of these had different obligations of repayment and risk tolerance compared with private cash. If a business could not repay bank loans, it went to bankruptcy, or if the business issued new stocks, the profit should be shared with new and existing stock holders. An executor could chose, or mix, these financing options to manage the risk and return. More freedom and choice meant more dynamic and precise resource allocation. Thirdly, and probably the most importantly, this separation and developed financial industry made it possible to create large enterprises. Before that, the maximum investment an entrepreneur could make was his own assets, and his friends' money if he is lucky. With sophisticated financial industry, executors started to have possibilities to raise huge amount of money from various investors or banks in order to increase the size of business operation. All of these factors lead to larger and more accurate allocation of resources, which created both larger companies and more number of successful companies.

Accumulation of assets, or means of production, was thought to be the cause of modern capitalism, but it was dynamic allocation of assets and resources that created sophisticated economy. It was true that large amount of assets was needed just to establish textile factory in England or car factory in US for instance, but these companies did not obtain cash from single wealthy individual, but they collected money from numerous investors. Most of companies in modern days borrow money some ways or the other in order to finance their operations. These investments come from various sources through sophisticated way. For example, banks might lend

depositors' money to other investment bank, which invest into venture capitals, and then the venture capital invests to start up companies. This chain of investments, caused by the specialization of investors, makes the size and dynamism of investment even higher. In other words, dynamic and large scale investments, caused by specialization of investors, enabled to develop modern capitalism.

This large and dynamic investment made impact on the allocation of other important resources, too. For example, when banks invested to profitable business and stopped investing to loss making ones, it would change the allocation of human resources. Good businesses could employ more and bad businesses could employ less. Also, profitable companies could employ highly qualified workers. In other words, financial institutions as a whole directed a society to shift labor from inefficient companies to efficient ones. Other resources were the same. Land and natural resources were all indirectly allocated though financial causes. Land was a limited resource for any countries. Even large country like US had limited land in downtown area to set up company or shops. Loss making companies went bankrupt and released scarce resources of urban or strategic locations such as down town New York or Silicon Valley, and this allowed more profitable companies to move in. In other words, dynamic and specialized financial industry made entire economy more efficient.

This increased the exchange in a society a lot. Before, the benefit and the cost of goods and services determined the total exchange amount. This principle did not change, but resource allocation started to influence the exchange on the top of simple cost and benefit principle. When a venture capital invested in a start up company that produced new high valued products, the purchasers of the product received new kind of benefits. In that manner, the society as a whole increased the total exchange. If a bank lent large amount of money to a manufacture to build a large scale factory, it helped producing a high quantity of products. That increased production was precisely the increase of exchange. Efficient allocation of resource allowed producing new products or increased the total production. Either way, society as a whole increased the total exchange.

4-4-7 Enlarged economy and its effects

The main focus of this Chapter is the development of exchange in the history, and it was proportionately related to the cost of transport and the size of economy. As the end of this Chapter, this section summarizes and clarifies the relationship of economic size and economic development.

ECAPD is the number of people living within the reach of a unit of exchange

cost. The bigger ECAPD means more people to buy a product and more labor and production capacity to satisfy these people's needs. In other words, large ECAPD is essentially the size of economy. As discussed in previous sections, bigger economy has a lot of effects, and it was the engine for the development of it. In the section 3-6 The feedback effect of exchange, it argued that specialization increase productivity, diversity of production, and number of investment opportunity. As a consequence, it continued, specialization increase the size of economy, and enlarged size of economy has a positive feedback effect to increase the degree of specialization.

This chain reaction of specialization and its effect on economy was often initiated by improvement of transport. When a better ship technology or maritime route was discovered, the cost of logistics would decrease, which consequently increased ECAPD. That meant more people living within the reach of improved ships. This new reachable people added the diversity to the economy. This was because in this diverse world it was hard to find the culturally identical people on the other side of mountain range or oceans. When people travel, they always find new and different cultures. For example, when Caesar entered Gaul, today's France, he found totally different Europeans there. When Muslim crossed Indian Ocean during the middle age, they found spice growing Southeast Asians. Also, large population increased the probability to find unique individuals. It was more likely to find genius and innovative individuals in larger population than in a village, hence it increased the number of innovations. Large population had labor force with different skills and specialization. In other words, higher ECAPD increase the diversity of the labor skills and products, and that increased the exchange.

Enlarged economy also had two different effects on investment. First, it increased the size of investment. After new maritime routes to Asia and New Continents were discovered by Europeans, stock-corporations mushroomed for trade. These corporations invested from establishing trading posts to purchasing ships, and the market was large enough to make equally large return against these big investments. From car manufactures to chip makers, today's global companies also invest huge amount of money for product developments, and this is because these companies can take return of investment from global market. If they, VOC or computer chip makers of 20th century, could operate only in original country, they could invest only a fraction of money into their business. There is no doubt that these investment opportunities can not exist without global economy. These large scale investments necessitate sophisticated financial and risk management products, which enable to manage and allocate such a large amount of resources.

Second effect of enlarged economy is to increase the number of investment[7] opportunities. This is because expanded economy increases ROI on some of the investments. Investment can be categorized into two types, variable investment and fixed investment. The variable investment is the kind of investment that can change its size. Employee training would be good example because company can train only a fraction of employees or all of them. Small investment would create small increase of skills, and large investment would make larger return. Fixed investment means that a fixed amount of investment is needed, and the return would not change regardless of its investment size. Building plant or R&D would fall into this category, because investment amount is fixed and can not be any less or more before receiving the return. Incomplete factory can not produce any products, for example. The return of fixed investments is proportionate with the size of market that the company operates. To put it different way, large market increase the opportunity of fixed investment that are feasible only in a large economy. VOC's monopolizing Asian spices were fixed investment, and the return was big because the market was entire Europe. Boeing and Airbus spend millions of dollars in R&D, because once they develop better airplane, they can sell it to the airline companies of the world.

The large economy leads to more specialization. By spending large amount of fixed cost investment, the society would have specialized companies with unique technology or competency. IT companies like Intel or Cisco would be good example. Pharmaceutical companies are also like that. Disney also spends a lot of money into to product development and sells them to the world. All of these companies invest a lot into what they are really good at, and keep their unique specialization. In short, large economy increase size and number of investment, and it can create higher level of specialization.

Supplemental Note - Roles of government for wealth creation

Wealth is exchange. People provide their labor to their employers in exchange for salary. They consume various goods in exchange for paying money. Society has to provide highly sophisticated mechanism of exchange in order to increase the income and the consumption. Sophistication and diversification of exchange increases the

[7]Investment here may not fit with accounting definition of investment. Investment in economic sense is expenditure of money with expectation of some form of return in the future. The expenditure can be small in size and the return can be in short or long term, because as long as there is some form of return, it would benefit the company and the economy as a whole.

utility of labor (i.e. income) and utility of consumption (i.e. well being). In this supplemental note, the roles of government for the sophistication of exchange are discussed.

S-1 Establishing and protecting freedom

The freedom is perhaps the most crucial prerequisite for developing the sophisticated exchange mechanism in a society. Suppression of individual freedom to exchange, either by communistic ideology or bureaucratic authoritarianism, is the worst thing that a government can do to its citizens. Freedom is important because it allows each individual to make different decisions and behavior. Diversity is nature of humanity, and laissez-faire makes individuals to behave different ways. However, centralized decision making does not create diverse behaviors by forcing each individual to follow the rules and restrictions made by authorities or bureaucrats in the central government. Diversity of behavior, as explained in Chapter 2, expands the diversity of economy. It allows individuals to consume depending on their unique preference, and to produce depending on their unique comparative advantages. It increases the diversity of products, which satisfy diverse needs of consumers, and the diversity of industrial inputs and equipments, which increase the productivity. Diversity creates different investment strategy or different types of companies. All of these lead to many opportunities and large benefit of exchanging different goods and services.

Also, different decisions increase the probability to find more correct behaviors. Given the limitation of human intelligence, society is more likely to have right decisions if the individuals chose to behave differently. This is even more important in complex society. The modern society is so complex that it needs diverse and unique specialists to handle different issues. Stock investors, product development specialists, researchers, or corporate executives, are just some examples whose decisions influence companies and society. If these individuals make different decisions, the result would be that some are very right, some are only slightly right, and some are wrong. The diversity can return a different degree of rewards depending on the correctness of the decisions, or return a punishing feedback for wrong ones. The rest of the society can learn from these various examples of success and failure in a society.

Freedom is important for consumption, or the wealth itself. Controlling production limits the choices of consumption. It could be possible that centrally commanded economy produce more quantity of selected products, but it can not

produce diverse products that fit diverse needs of consumers. Soviet Union had technology to go to space first, or had production capacity for basic needs of food and housing. But it never produced diverse products to satisfy diverse needs. Wealth in Western society is not really depending on the total amount of production, but its ability to produce various goods and services. Higher wealth means diverse consumption, so a government should increase the variety of goods and services available in a society by developing higher degree of freedom.

S-2 Reduction of exchange cost

Exchange is the wealth itself, and increasing exchange means increasing the well being of citizens in a nation. All of exchange is conducted with, sometime implicit, analysis of cost and benefit. Therefore, reducing the cost of exchange is one of the important governmental duties. Governments have to develop good infrastructure for transport. Roads, highways, ports, and airports, are all good examples. It is true that some developed countries over-invest in these infrastructures, and no other nations should follow that mistake. Yet, generally speaking, the developing countries do not have enough transport infrastructures, and that is why remote villagers could not participate in market economy. Lack of decent port makes it harder or more expensive to import or export goods. Expensive industrial inputs and equipments, which are often imported from developed countries, makes it harder to develop industry, and more expensive to export.

Governments also should reduce tariff. Tariff puts extra cost on imported goods, and hinders exchange. Historically, this was one of the major problems that held back the development of exchange. Hefty tariff greatly reduced trade in many periods of history and many countries in the world.

S-3 Optimizing resource allocation

Being poor is not caused by lack of resources, but is due to social incapability to develop exchange. Poor people often do not have opportunities to exchange their labor with cash income, for instance. One powerful tool to develop exchange mechanism is resource allocation. Financial institutions have to be developed to finance the creation of large companies, which create large number of jobs. These financial institutions have to be effective for supporting profitable companies and for eliminating unprofitable ones. By allocating financial resources to efficient companies, these companies can use more labor, land, and other resources. In other words, optimizing financial allocation leads to optimizing other resources, too.

On the other hand, one of the worst things a government can do to efficient resource allocation is subsidiary. By spending tax payers' money, the government keeps certain, often unprofitable, industries from diminishing. Subsidiary prevents loss making companies from going bankruptcy. Unprofitable companies are not good for society, because they keep using financial and human resources. They continue to spend money into unprofitable projects, and keep the land and human resources. Because these resources are locked by unprofitable companies, the society can not allocate them to profitable and efficient companies.

Effective resource allocation is important for the consumption, also. Dynamic and efficient resource allocation forces companies to produce the goods and services that consumers want. Also, it forces them to produce diverse products that fit unique needs of each consumer. By having more choices to buy from diverse and demanded goods, the consumers can utilize their income better. In other words, efficient and accurate production increases the utility of consumers' money, and hence well being.

S-4 Externality adjustment

In all economic decisions, there are three aspects of exchange. There are decision making, cost paying, and benefit receiving from a transaction. In purchasing, there are decision maker, benefit receiver, and payer. Usually these are the same person. The person who makes decision to buy something is the one who pays and obtains the benefit. A simple example is that a person makes a decision to pay money for a candy, and he eats it. Yet, sometimes, these costs or benefits can be spread or transferred to other persons, and these people receive benefits or bear costs by other people's decisions. This is called externality. When externality happens, the governmental intervention is needed.

Education is good example. In this case, the parents are the decision makers for smaller children. They are the ones who decide which school they send their children. Benefit receiver is a child and the society itself. The child is obvious beneficiary because educated person would earn more money once starts to work. Society is beneficiary also because the society as a whole benefit from productive work force. Cost payers are parents because they pay the tuitions. Yet, government pays the cost also by providing cheaper education through operating public schools or paying scholarship. The externality here is that the society benefit from the educated work force. So, the government bear portion of the educational cost so that more children can receive better education for less cost. This is all good and theoretically justified for optimizing education level in a society.

Other example would be pollution and environmental destruction. In the process of manufacturing goods, many factories emit hazardous material, which could be contamination in a river or emitting carbon dioxide into atmosphere. Here, the company is the decision maker to set production and contamination level and also the benefit receiver because they get profit through production. It pays the cost also by bearing the expenses needed to run the company. However, additional cost is paid by victims of pollution usually in form of damaged health. A part of production cost is transferred to people living in the surrounding area. Under that circumstance, the government is obligated to set a regulation to require the company to set up anti-contamination measure. This brings back the cost of production from the unhealthy citizens to the manufacturer, the one that has to pay the full cost.

Externality is hard to measure and put into numbers. For that reason, the concept of externality is sometimes mistreated by some governments, and it is used as a reason for governmental intervention. On the other hand, some governments do not do anything when it is really needed. Economics provides theoretical justification to intervene externality, yet perhaps political science is better for practical guide for handling this issue.

S-5 Order of law

Order of law is very common but highly crucial elements of developed society. In developed countries, people take it for granted so much that few people realize the importance of it. However, order of law is probably the most fundamental part of developed economy, and there are, at least, two reasons for it. First, it reduces the act of force. Without order of law, the strong wins and the weak gives in, and the strong often determine the behavior of the weak. Robbers steal valuable resources of ordinary people, or big businesses might force children into child labor. In a society where individual choice is protected by law, people make their own decisions by calculating the cost and benefits every time they commit exchange. The consumers can decide what and how much products they consume, and producers decide how much capital they use and how much products they produce. This enables to maximize the benefits from exchanges, and allows resources to be allocated in optimized way. Yet, in the world where the strong controls the weak, the freedom of the weak would be undermined greatly and the power influences more than the cost-benefit analysis. The reduced free choice would hinder optimization.

Secondly, and perhaps more importantly in modern economies, the order of law reduces the act of cheating. Cheating, or fraud, increases the risk of business

transaction, and too much fraud simply freezes the economy. This becomes more important for financial industry. Buying goods is relatively easy to prevent fraud because purchaser can inspect the goods before they buy. Yet, most of transactions in financial industry are the exchange of money and promise, which can range from promise of paying dividend or debt, to promise of completing future option. A depositor puts money in bank account in exchange for the promise of the bank to return the money with interest. When a bank lends money to a company, the company is making promise to return the money with interest. When an investor buys a stock, he is counting on the promise and capability of the company to pay dividend in the future. To put it in other way, allocation of financial resource is allocation of credit. The bank with more credit receives more money. Companies receive more bank loans if they have better credit. Modern financial companies are connected with each other in very complex way. It is like a web of credit, though which money is distributed. If the legal and judicial systems are not established firmly for financial transaction, the more fraud would be inevitable and the cost of protecting and hedging from the risk of fraud would be greater.

This is what happens in many third world countries. The legal system is not well developed for financial transactions and contracts, so the banking system exists only at big cities lending to a small number of large companies only. In rural area, legal system functions even less efficiently, and corrupted police officers and bribes often influence judicial system more than law itself. When somebody borrows money and walks away with it, there is limited way for the lender to chase him. On the other hand, some lenders, such as large landlords, charge outrageous interest for the poor or peasants. The legal system often fails to provide personal bankruptcy protection. The money can go to people who cheat or can not repay, so financial system tend to be less optimized. That makes it hard to develop efficient resource allocation.

Conclusion

Humans may be intelligent being. However, the accuracy of human decisions is always undermined by complexity of this world. To make right decisions, one has to have deep knowledge about too many things. Universal knowledge, a full and complete knowledge needed for right decision making, is impossible to obtain. Also, there are many uncertainty or mutation about the way society work. So, even if humans act like computer, the uncertainty and lack of

complete information inevitably leads to wrong decisions. This calls for a theory that explains how the humans, with limited rational behavior, developed the civilization to such a high level.

The crucial part of this theory is the diversity and communication, both of which are natural characteristics of human society. Diversity makes humans try different things and behave differently way. This diverse trial creates diverse successes and failures. Communication allows people to learn these different outcomes. Even under extreme example, such as the case where all humans behave irrationally, diversity of behavior creates good and bad results by chance. With communication, people can learn from them and optimize their won decisions.

Combination of exchange and diversity bring even more benefits to society. First, diversity is one of the causes of exchange. If all the humans were the same and produce same goods, there would be no item to exchange. The more different goods and services people produce, the more demands and incentives of exchange there would be. Also, when a society produces diverse tools and equipments, it helps to increase the productivity because producers, from craftsman to companies, are likely to find the most suitable equipments for their production. Another benefit is that diversity of economic activity leads to more opportunities of investment. In a society where there is only one industry, it is the only investment destination. Yet, diverse industries mean more investment opportunities. Lastly, it enhances the liquidity of assets, hence optimizes the price. When people make different decisions about the price of assets, there would be more selling and buying because financial transaction takes place only when the two parties see different values in an asset. If investors are the same, same degree of rationality for instance, they would evaluate the value of assets at the same way and there would be less trade. Yet, in real word the repeated transactions of diverse traders, not logical evaluation, leads to the optimization of asset price.

Higher degree of diversity in production means to higher specialization, and specialization bring additional benefits. Specialized workers improve productivity by becoming better at specific task and by concentrating on what he is really good at. Specialists or experts on a production are the ones who invent new technology and new products. Specialization also increases the investment opportunity with higher ROI. Specialized workers or companies do the same task for most of their time, so the utility rate of equipments and facilities would be higher. When utility rate is higher, the return from the equipments, or investment, would be higher also.

All of these benefits of specialization, diversity, and exchange, increase the productivity, and hence the size of economy. The size of economy increases the specialization in return, so the whole process has positive feedback effect. This was the reason for the huge difference between civilized regions and rural areas in history or between developed countries and developing ones today.

Human history experienced this feedback effect at least three times. First, it was formation of city, which happened during the rise of ancient civilization. This was the simplest but most effective way to reduce the cost of exchange. Compared with inter-village trade, transport cost within a city became almost nothing, and well established rules and norms made a lot easier for merchants to trade. These reduced costs created huge leap in exchange.

Second, it was development of regional trade through development of maritime transport, which enabled traders to travel longer distance. This age was from ancient Greece to Middle Age. The improved transport increased ECAPD, which is the number of people reachable by same exchange cost. Enlarged ECAPD increased the production and consumption within, and more people started to exchange each other. Just like the time when city was formed, this meant the expansion of the market size. Besides all the benefits of enlarged economy, larger size of market particularly increased the production level and degree of specialization.

Lastly, the age of mass-transport and modern capitalism arrived. This age was characterized by development of transport again, such as new maritime route, canal and railway system, and development of financial industry. Ships that reached all over the world brought the rise of global trade first time in history. Trade started to be operated at much larger scale. Exchange inevitably increased, and started to require more money and workers. Sophisticated resource allocation made this global operation of enterprises possible. Modern financial industry collected money from a large number of individuals and allocated it to profitable projects. Through controlling of monetary resource, it managed other resources because the companies that do not receive investments could not utilize more workers or offices for instance. By making sure that loss making companies release resources and that profitable companies expand operation, the society as total kept increasing exchange.